

WEIGHT-RELATED HEALTH BEHAVIORS AND BODY MASS:  
ASSOCIATIONS BETWEEN YOUNG ADULTS AND THEIR PARENTS,  
MODERATED BY PARENTING STYLES

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**Title**

Weight-Related Health Behaviors and Body Mass: Associations between

Young Adults and their Parents, Moderated by Parenting Styles

**By**

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**DOCTOR OF PHILOSOPHY**

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## ABSTRACT

Niemeier, Brandi Shea, Ph.D., Program of Human Development, College of Human Development and Education, North Dakota State University, March 2011. Weight-Related Health Behaviors and Body Mass: Associations between Young Adults and their Parents, Moderated by Parenting Styles. Major Professor: Dr. Joel M. Hektner.

The incidence of overweight conditions among children and adolescents is a growing national concern. Although current literature suggests that parental health behaviors could influence health behaviors of children, studies have not explored the actual predictive relationships of parents' and their children's weight statuses and weight-related behaviors. In addition, current studies have not tested the influence of parental authority, family communication, or demographic characteristics on the relationships.

This study first examines factors that contribute to overweight conditions among children and adolescents and the associated costs. Studies of interventions that target children's and adolescents' weight-related health are then reviewed and provide evidence that parental involvement contributes to intervention success. The theory of planned behavior, social cognitive theory, social action theory, and systems theory are discussed and support the notion that parental influences contribute to the development of children's weight-related health behaviors. To test the relationships, 151 young adults and their parents were recruited and completed a series of questionnaires to describe their weight statuses, dietary behaviors, and physical activity behaviors. In addition, the young adult participants completed questionnaires to further describe their parents' parental authorities and their family communication environments during childhood and adolescence.

Comparisons of body mass index, average daily energy consumption, average weekly energy expenditure, and physical activity enjoyment of young adult participants and their parents were conducted with correlation analyses and paired-samples t-tests. Further, multiple regression analyses were used to explore the influence of parental authority and family communication, and demographic characteristics were also considered.

The empirical results of the current study indicate that, overall, parents' weight statuses and dietary behaviors help predict weight statuses and dietary behaviors of their young adult children. Further, parental authority scales interact with the relationships. At high levels of authoritarian and permissive parental authorities, young adults tend to have weight statuses that are opposite to those of their parents; at high levels of authoritarian parenting, young adults also tend to follow opposite dietary consumption patterns. The findings in this study have implications for professional practice, parenting practices, and the design of intervention activities. Recommendations for future research are provided.

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## CHAPTER 1. INTRODUCTION

Diet and weight of both children and adults in the American population are a national concern, and overweight conditions among children and adolescents have become a growing focus of public health (United States Department of Health and Human Services [USDHHS], 2000, 2011). According to results from the National Health and Nutrition Examination Survey (NHANES), the prevalence of overweight conditions among children and adolescents has had an increasing trend since the mid-1970's (Ogden & Carroll, 2010). The 2007-08 NHANES revealed that 10.4% of children aged 2 to 5 years, 19.6% of children aged 6 to 11 years, and 18.1% of adolescents aged 12 to 19 years are overweight (Ogden & Carroll). The rise of childhood and adolescent overweight conditions is present among most developed and developing nations, and the United States is among the few countries that lead this trend (Lobstein, Baur, & Uauy, 2004).

Given recent concerns about the increasing rates of overweight conditions among children and adolescents, studies that investigate associations with weight-related behaviors have become particularly worthwhile. Current literature does include reports of such studies. For example, some studies suggest that parenting styles influence the development of health behaviors of children (Arehart-Treichel, 2007; Lohaus, Vierhaus, & Ball, 2009; Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006) and that race and socioeconomic characteristics are related to weight status and health habits of individuals (Henderson, 2007; Maziak, Ward, & Stockton, 2008; Nelson, 2007; Yancey & Kumanyika, 2007). Family communication environments may also influence children's and young adults' well-being (Koesten, Schrodts, & Ford, 2009; Schrodts,

Ledbetter, & Ohrt, 2007) and young adults' health habits (Baxter, Bylund, Imes, & Scheive, 2005).

This manuscript will review implications of child and adolescent weight statuses and will examine in greater detail the associations of parental weight statuses and behaviors, parenting styles, communication environments, and demographic characteristics. Specifically, costs of overweight conditions among children and adolescents will be discussed, key contributors to child and adolescent weight problems will be highlighted, and a detailed review of recent related interventions will be provided. The relationships of parents' weight statuses, dietary behaviors and physical activity behaviors and their respective children's weight statuses, dietary behaviors and physical activity behaviors will be further explored and tested. The influence of parenting styles, family communication environments and demographic characteristics will also be examined.

### **Costs of Overweight Conditions**

Overweight conditions in childhood are associated with increased risk for chronic diseases (Freedman et al., 2008; Johnston, 1985; Li et al., 2008; Martini et al., 2001; Mojnar, 2003; Murthy, Mukherjee, Ray, & Ray, 2009; Rees, Thomas, Brophy, Knox, & Williams, 2009; Signorino & Winter, 2008; Weintrob, Stern, Klipper-Aurbach, Phillip, & Gat-Yablonski, 2008) and other health concerns (Lobstein et al., 2004; Yancey & Kumanyika, 2007). Lobstein et al. suggest that multiple organ systems are negatively affected by excessive bodyweight in children, and almost all organ systems are negatively affected by obesity. Related health conditions include Type II diabetes, breathing disorders, fatty liver disease and cardiovascular disease symptoms (Lobstein

et al.). In addition, overweight children and adolescents experience reduced physical abilities, mental health problems and related social consequences (Lobstein et al.).

Juvenile overweight conditions usually persist into adulthood, and the aforementioned consequences follow or worsen (Heath & Panaretto, 2005; Serdula et al., 1993; Yancey & Kumanyika, 2007). Individual and societal costs related to overweight and obese conditions are difficult to establish but are likely innumerable. They include healthcare costs, decreased productivity, reduced quality of life and premature mortality (Lobstein et al., 2004; USDHHS, 2000, 2011).

### **Contributors to Child and Adolescent Weight Problems**

Excessive body weight is the result of an imbalance between energy intake and energy expenditure. The factors that contribute to the imbalance, however, are quite complex. Combinations of risk factors, such as high television consumption, maternal smoking in pregnancy, sedentary lifestyle, low meal frequency and early postnatal formula feeding are leading contributors, according to Toschke, Rückinger, Böhler, and Von Kries (2007). Excessive consumption of energy-dense foods accompanied by a decreased consumption of nutrient-dense foods is also a leading risk factor (Colapinto, Taper, & Veugelers, 2007). Culture and media have perhaps contributed to the excessive consumption of energy-dense meals. Generally, current meal preferences among children and adolescents include large portioned, energy-dense, convenient and inexpensive foods (Maziak et al., 2008). Increased soda consumption contributes to excessive bodyweight (James, Shepard, Cavan, & Kerr, 2002), and many high-sugar, high-energy foods have replaced fruits and vegetables (Zapata, Bryant, McDermott, & Hefelfinger, 2008). Enten and Golan (2007) suggest that children's eating behaviors are



influenced by parenting styles, and parents' knowledge about nutrition affects children's learned eating habits (Gibson, Wardle, & Watts, 1998).

Toschke et al. (2007) have illustrated that environmental characteristics impress upon a child's learned decision-making related to diet and exercise habits. Children's environments are determinants of physical activity levels, and the availability of healthful foods impacts children's eating behaviors (Nelson, 2005). Modern technology and the availability of television viewing result in sedentary lifestyles, and other factors, such as parents' work schedules, contribute to low levels of physical activity and physical fitness among children and adolescents (Özdirenç, Özcan, Akin, & Gelecek, 2005).

Individuals of minority status are at increased risk of being overweight or obese (Henderson, 2007; Nelson, 2007; Ogden et al., 2006; Yancey & Kumanyika, 2007). According to Yancey and Kumanyika, rates of overweight or obesity among elementary school children who are of low-income, urban, or minority status are higher than those of elementary school children who are from middle- or upper-class families, live in rural settings, or are of non-minority status. Maziak et al. (2008) also found that socioeconomic variables are associated with the prevalence of overweight conditions, and the safety and walkability of neighborhoods largely influence outdoor activities among children and adolescents (Maziak et al.; Yancey & Kumanyika). The convenience of automobiles has replaced biking and walking, and the safety of indoor play has discouraged outdoor play ("Childhood Obesity," 2001).

In school-aged children, increases in overweight and obese conditions have been attributed to decreased opportunities for unorganized physically active play at school,

the elimination of physical education course requirements, and increased availability of more expensive organized sports (Gombosi, Olatin, & Bittle, 2007). In addition, school cafeterias are often required to remain within tight budgets while also serving food that children will purchase (Gombosi et al.).

Children with particular disabilities may be at risk for physical inactivity, as suggested by Pan (2008). Illnesses, diseases and food allergies can influence dietary habits (Laiho, Nuutinen, Malin, & Isolauri, 1998; Øverby et al., 2007; Sanchez-Albisua et al., 2005; Tau, Mautalen, De Rosa, Roca, & Valenzuela, 2006; Vlieg-Boerstra et al., 2006). Genetics may also play a role in the weight status of children (Hur et al., 2008; Maes, Neale, & Eaves, 1997; Meyre et al., 2005; Silventoinen et al., 2007). Some authors have suggested that appetite and overeating are related to genetic variations (Carnell & Wardle, 2009; Kral & Faith, 2007; Wade, Treloar, Heath, & Martin, 2009).

## CHAPTER 2. REVIEW OF INTERVENTIONS

Given that many contributors to child and adolescent weight problems are modifiable, numerous interventions that attempt to shift related risk factors and behaviors have been developed and reported. Such interventions typically promote increased physical activity, decreased sedentary activity, an increase in healthy eating, and a decrease in unhealthy eating among child and adolescent participants.

Characteristics and outcomes of child and adolescent overweight and obesity interventions are of particular interest in this study. Therefore, an extensive literature search and review of related interventions was conducted. The following inclusion criteria were applied to effectively compare reports of interventions:

1. Interventions: Original preventive interventions that targeted weight-related health and health behaviors of children or adolescents, reported in January 2004 through December 2008.
2. Intervention Participants: Children or adolescents, ages 4 to 17 years.
3. Measurements: Pre-measurements, and post-measurements which were conducted immediately following the interventions, to assess the effectiveness of the interventions and which include body mass index (BMI).

Only reports of interventions that actively targeted broad behavioral habits (i.e. dietary habits, physical activity habits, or sedentary activity habits) in children or adolescents were of interest. Therefore, reports with the following characteristics were excluded from this review:

1. Policies: Implementations of new policies or changes to existing policies.

2. Singled-Out Restrictions: Limits to a specific food or drink (i.e. sugar-sweetened beverages) or activity (i.e. television viewing).
3. Medical Practices: Use of medications or invasive medical procedures.

Reports of 19 interventions among 16 research articles met the above criteria and were included in this review. Two of the research articles reported on multiple interventions, and each intervention was reviewed separately.

It should be noted that BMI is a calculated measure and does not directly measure body fat (USDHHS, 2009), thus limitations are inevitable when using BMI to measure total body fat and body fat percentages. However, the BMI measure does provide a reasonable estimation of body fatness (Steinberger et al., 2005) and is a standardized measure that is used consistently in research literature to evaluate, among other things, the effectiveness of weight-related interventions. Therefore, literature which employed the BMI measurement to help determine the effectiveness of interventions was included in this review.

Seven uncontrolled and 12 controlled studies were included in this review. An assessment of all 19 studies will be discussed followed by a brief examination of only the 12 controlled studies.

The intervention activities reviewed generally consist of nutrition education, physical activity education, physical activity sessions, behavior education or behavior therapy, or a combination of these activities (see Table A1). Nutrition education included lectures or sessions, many of which provided educational materials that described the characteristics of and the benefits of healthful eating. Physical activity education generally included sessions which facilitated discussion and provided

educational materials that described the characteristics and benefits of having a physically active lifestyle. During physical activity sessions, participants actually engaged in physical activity. Many interventions which included physical activity sessions encouraged the development of physical activity skills, while others simply promoted unorganized physically active play. Behavior education and behavior therapy included group sessions or individual counseling that promoted self-control and self-efficacy and encouraged behavior modification to improve dietary, physical activity or sedentary activity habits.

Trends were revealed among intervention activities and related outcomes. As illustrated in Table 1, of the 19 interventions, 11 (57.9%) noted marked decreases in participants' BMIs immediately following the intervention activities. Interestingly, of this subset, 10 (90.9%) were more comprehensive in nature, as they consisted of two or more intervention activities. For example, the intervention reported by Hunter, Steele, & Steele (2008) consisted of nutrition education, physical activity education, and behavior therapy activities. Of the eight interventions that showed no significant decrease in participants' BMIs, three (37.5%) consisted of more than one intervention activity.

Of the 13 comprehensive interventions, 10 (76.9%) resulted in decreases in participants' BMIs. Of the remaining six interventions that consisted of only one activity, one (16.7%) reported decreases in participants' BMIs following the intervention.

As shown in Table 2, the involvement of at least one parent or caregiver is associated with decreases in participants' BMIs following interventions. Eight (42.1%)

of the 19 interventions reviewed noted parental involvement, six (75.0%) of which reported successful BMI decreases. Of the 11 interventions that did not involve a parent, five (45.5%) reported decreases in participants' BMIs.

Table 1

*Comparison of Intervention Activities and Post-Assessment Measures of BMI*

Post-assessment measure	Intervention Activities		Total
	Comprehensive	Not comprehensive	
Decrease in BMI	10	1	11
No decrease in BMI	3	5	8
Total	13	6	19

Table 2

*Comparison of Parental Involvement and Post-Assessment Measures of BMI*

Post-assessment measure	Parental Involvement		Total
	Parent(s) participated	Parent(s) did not participate	
Decrease in BMI	6	5	11
No decrease in BMI	2	6	8
Total	8	11	19

This trend is consistent with one of the findings reported by Hunter et al. (2008). In a family-based treatment for overweight and obesity, parents' attendance at behavior therapy sessions was a significant predictor of decreases in children's BMIs (Hunter et al.). In addition, parents' weight loss was the greatest predictor of children's BMI reductions, accounting for 18.8% of the children's BMI changes (Hunter et al.).

Eight interventions consisted of multiple intervention activities *and* parental involvement. Of these, six (75.0%) reported BMI decreases. Of the six interventions that included only one activity and no parental involvement, one (16.7%) reported decreases in participants' BMIs.

Upon examination of the 12 controlled interventions (see Table 3), five (41.7%) resulted in significant decreases in participants' BMIs. All five interventions which resulted in decreases in participants' BMIs were comprehensive, including more than one intervention activity. Of the remaining seven interventions which did not show significant decreases in participants' BMIs, three (42.9%) were comprehensive interventions.

Of the eight comprehensive interventions, five (62.5%) resulted in decreases in participants' BMIs. Of the four interventions that consisted of only one activity, none (0.0%) reported decreases in participants' BMIs following the intervention.

As indicated in Table 4, five (41.7%) of the 12 controlled interventions noted parental involvement. Of the five interventions that noted parental involvement, three (60.0%) reported significant BMI decreases. Of the seven interventions that did not involve a parent, two (28.6%) reported decreases in participants' BMIs.

Table 3

*Comparison of Intervention Activities and Post-Assessment Measures of BMI among Controlled Studies*

Post-assessment measure	Intervention Activities		Total
	Comprehensive	Not comprehensive	
Decrease in BMI	5	0	5
No decrease in BMI	3	4	7
Total	8	4	12

Table 4

*Comparison of Parental Involvement and Post-assessment Measures of BMI among Controlled Studies*

Post-assessment measure	Parental Involvement		Total
	Parent(s) participated	Parent(s) did not participate	
Decrease in BMI	3	2	5
No decrease in BMI	2	5	7
Total	5	7	12

All five of the controlled interventions that involved parents also consisted of multiple intervention activities. Of these, three (60.0%) reported BMI decreases. Of the four interventions that included only one activity and no parental involvement, none (0.0%) reported decreases in participants' BMIs.



In summary, the interventions reviewed that included comprehensive approaches were more likely to be effective at decreasing BMI. This finding is consistent with previous reviews that have noted marked successes among interventions that include multiple activities to encourage healthy weights (Baur, 2004; Peterson & Fox, 2007; Philippas & Lo, 2005). Further, previous reviews have found that multi-layered approaches which involve multiple sectors and community groups have proven successful (Avenell & Goode, 2008; Bautista-Castaño, Doreste, & Serra-Majem, 2004; Bowman, 2005).

### **Parent Involvement**

Parent involvement contributed to the success of interventions. This finding is consistent with previous reviews that have found that both parent behaviors and parent involvement in interventions are consistently positively associated with children's and adolescents' healthy weight-related behaviors (Avenell & Goode, 2008; Bautista-Castaño et al., 2004; Bowman, 2005; Caroli, Argentero, Cardone, & Masi, 2004; Lansky & Vance, 1983; Peterson & Fox, 2007; Philippas & Lo; Roberts, 2000).

McGarvey et al. (2006) interviewed participants in the *Women, Infants, and Children (WIC)* program and suggest that parents *want* to do what is good for their children. However, actual parental practices related to their children's diets are influenced by family, culture, and the media. In addition, McGarvey et al. suggest that the parents they interviewed likely had a lack of knowledge about the relationships between dietary intake, physical activity, and body weight. Many of the parents did not think that overweight conditions among preschool children posed any real health threat

and instead believed that overweight preschool children would generally grow out of being overweight.

Seidell, Nooyens, and Visscher (2005) indicate that adult-centered intervention programs may be more efficient and cost-effective than similar child-centered interventions in actually reducing weight-related health problems. This may be, at least in part, because weight-related health problems are more commonly present in overweight adults, and the results of interventions are thus more likely to be considered successful when health problems are effectively treated or prevented. Child-centered interventions, however, have rarely indicated actual decreases in health risk, because weight-related health problems usually do not actually manifest until adulthood and are therefore not measured. Thus, in order to maximize the number of people that experience reductions in weight related health problems, interventions targeting adults would be recommended.

In addition, Seidell et al. (2005) indicate that adult-centered interventions are more efficient for communities, because they are more likely than child-centered interventions to have positive effects on others. Interventions that target adults, for example, have indirect effects on others in the participating adults' households, while interventions that target children usually benefit only the participating children.

Long-lasting behavior change and *prevention* of weight-related health problems may be more likely, however, when interventions target children (Fussenegger, Pietrobelli, & Widhalm, 2007; Seidell et al., 2005). Behavior may be more easily changed in children than in adults, and the origins of weight-related health problems are thought to be altered more effectively in childhood (Seidell et al.).

Given these findings along with the current review findings, it seems plausible that a parent-centered intervention would be a more cost-effective option. If the intervention indirectly but ultimately affected children or adolescents, it would likely result in long-lasting behavior change and reduced risk of weight-related health problems among the children and adolescents. Therefore, a cost-effective and promising approach to targeting weight-related health in children and adolescents would aim to modify parents' behaviors by involving parents as the *active participators* in intervention activities, while their respective children would participate only as *passive beneficiaries* of the intervention effects.

### **Interventions that Involve Parents and Target Children**

A review of interventions that indirectly target children and adolescents by encouraging behavior change among parents was conducted. Interventions that were included in the review were reported in January 2004 through December 2008, aimed to improve weight-related health among children or adolescents and targeted parents as intervention participants and their respective children as research participants for pre- and post-assessments.

Overall, the studies reviewed found that weight- or health-related interventions that are targeted at parents and caregivers will likely result in improved eating and physical activity behaviors of entire families and will help improve weight for both parents and their children (Blom-Hoffman, Wilcox, & Dunn, 2008; Chen, Weiss, Heyman, Vittinghoff, & Lustig, 2008; Haire-Joshu et al., 2008; Hunter et al., 2008; McCallum et al., 2007; Talpade, 2008). Project HEALTH (Talpade), for example, focused on educating African-American parents about the effects of nutrition and

physical activity on various health and wellness factors. Following the project, participants were more knowledgeable about the benefits of good nutrition and regular physical activity, and they were more aware of health-related risks. Participants also showed marginal improvements in their grocery shopping behaviors, activity levels, and food intake habits, suggesting that the participants' children, who are largely the recipients of purchased groceries and planned activities, benefited as well.

A parent-child reading program reported by Blom-Hoffman et al. (2008) encouraged parents to read with their children and supplied age-appropriate books which discussed the benefits of fruit and vegetable consumption. Following the project, the parent participants demonstrated an increased knowledge and awareness of needed fruit and vegetable consumption and improved nutrition habits. In addition, the participants self-reported increased fruit and vegetable consumption among their children.

Chen et al. (2008) found that an individually tailored mother-child educational program which was delivered via postal mail effectively improved health habits, knowledge about nutrition and physical activity, and overall weight health among Chinese American children. Each of the participants' mothers received individual reports on her child's weight status, dietary intake, physical activity habits, and sedentary activity habits. Mothers also received educational materials that were tailored to help each of them encourage improved health habits and, ultimately, an improved weight status for her child. Although mothers' usual food choices, physical activity habits and knowledge about nutrition and physical activity did not improve significantly, their children's health habits and knowledge improved. In addition, BMI declined

significantly among the overweight child participants, and BMI remained relatively unchanged among the normal-weight participants.

McCallum et al. (2007) reported the results of a randomized controlled trial of parents' participation in the *Live, Eat and Play* (LEAP) program. Over a 12-week period, parents attended four consultations with general practitioners to set and record healthy lifestyle goals for their families. Each family was given a "Family Folder" which contained educational materials about healthy behaviors and behavior change, and it included suggestions for reaching the healthy lifestyle goals. At 9 months following the intervention, children's BMIs decreased significantly, although at 15 months following the intervention, the children's BMI decreases were not significant when compared to the control group. The intervention group reported improved nutrition habits and increased physical activity levels at both the 9-month and 15-month follow-up assessments.

Haire-Joshu et al. (2008) also found that parents' dietary behaviors influence their children's dietary behaviors in "High 5 for Kids," a home visiting program. The aim of the program was to improve fruit and vegetable intakes among parents and their preschool children. Following the intervention, participating parents reported increased fruit and vegetable consumption, improved knowledge about fruits and vegetables and increased availability of fruits and vegetables in their homes. The parents' changes in fruit and vegetable consumption were a significant predictor of the preschoolers' changes in fruit and vegetable consumption.

## **Directions for Future Research**

Reports of parent-centered interventions have been discussed above but are limited. The studies have observed that changes in parents' dietary and physical activity behaviors have led to similar changes in their respective children's dietary and physical activity behaviors. More research and regression analyses are needed, however, to test whether parents' dietary and physical activity behaviors are actually predictors of children's dietary and physical activity behaviors. Such a predictive relationship would support the need for future intervention efforts that target parents as the *active participators* in intervention activities and their children as the *passive beneficiaries* of intervention effects.

## **Other Related Variables**

**Parenting styles.** In 1971, Baumrind proposed that one of three parenting styles of authority are used by parents: (1) the *authoritative* parenting style, in which parents steadily guide their children and openly provide direction, and discipline is clear, understood by the children, and accompanied by warmth, discussion, and reasoning; (2) the *authoritarian* parenting style, in which parents expect strict obedience from their children, and discipline is considered a punishment tool to help control children; and (3) the *permissive* parenting style, in which parents place value on allowing their children to be independent and make their own decisions, and discipline is usually minimal. Parenting styles may influence the development of health behaviors among children. Current literature suggests that the authoritarian parenting style is associated with excessive weight in children (Rhee et al., 2006). When compared with authoritarian and permissive parenting styles, the authoritative parenting style is more closely associated

with increased levels of positive health behavior (including good nutrition, physical activities, and good hygiene practices) and decreased levels of negative health behavior (including poor nutrition, sedentary behaviors, alcohol use, and nicotine use) during the transition from childhood to adolescence (Lohaus et al., 2009).

Children who perceive that their fathers have a permissive parenting style tend to weigh more (Arehart-Treichel, 2007). Also, characteristics of disordered eating among children are inversely correlated with fathers' authoritative parenting style and are positively correlated with fathers' authoritarian parenting style (Enten & Golan, 2009). More research is needed, however, to test the actual moderating influence of parenting styles on the relationships between parents' and their children's dietary and physical activity behaviors.

**Family Communication Environments.** Current literature suggests that children learn dietary and physical activity behaviors by interacting with their environments (Toschke, et al., 2007). Koerner and Fitzpatrick (2002) further propose in their theory of family communication schemata that family members share many experiences and, therefore, share perspectives that are peculiar to family norms. Collectively, family experiences, perspectives and norms shape family communication environments, and family communication environments shape individual family members (Koerner & Fitzpatrick).

Fitzpatrick and Ritchie (1994) have proposed that one of three types of communication environments tend to be followed by families: (1) an environment of *family expressiveness*, in which all family members are encouraged to openly express their personal views and feelings; (2) an environment of *structural traditionalism*, in

which parents expect children to strictly conform to parents' rules; and (3) an environment of *conflict avoidance*, in which family members avoid conflict at most any cost by either withholding conversation or by conforming to family rules. Family communication environments may influence the well-being of family members. Schrodt et al. (2007) studied conversation and conformity orientations of family communication patterns to examine the role of parental confirmation and affection in children's development of self-esteem, perceptions of stress, and mental health symptoms. According to Koerner and Fitzpatrick (2002), family communication patterns that have high levels of conversation orientation encourage family members to interact freely with one another to openly engage in a wide range of ideas and activities. Families with low levels of conversation orientation, however, less frequently share personal ideas and feelings and are less likely to participate in activities together. Koerner and Fitzpatrick further describe that families with high levels of conformity orientation adhere to similar thoughts and beliefs, follow a hierarchical family structure, and value family well-being over individual family members' well-being. Families with low levels of conformity orientation encourage individual family members' values and personal growth.

In their study of family communication environments and children's well-being, Schrodt et al. (2007) provide evidence that conversation orientations in families increase children's levels of self-esteem, reduce children's levels of stress, and improve children's mental health; conformity orientations, however, have the opposite effect. Parental confirmation and affection were found to play a significant role in mediating the influences of both conversation orientations and conformity orientations on



children's self-esteem and perceived stress levels. Also, parental confirmation mediates the relationship of conversation orientations and conformity orientations on children's mental health.

Koesten et al. (2009) studied the influence of communication environments on the well-being of young adult children in families and found that structural traditionalism is a negative predictor of young adults' well-being. Conflict avoidance is a negative predictor of cognitive flexibility; however, family expressiveness is positively related to cognitive flexibility and, together, family expressiveness and high levels of cognitive flexibility lead to increased well-being for young adults.

Baxter et al. (2005) suggest that family communication environments influence children's tendencies to continue engaging in health-related lifestyle behaviors that were created by their parents. Specifically, young adult children of expressive family communication environments are less likely to comply with the family health behavior rules, or patterns of health behavior, that they learned from their families than young adult children of structural traditionalism or conflict avoidance environments. It is likely that, since children of expressive communication environments are encouraged to think about and express their own opinions and feelings, they develop a sense of independence in choosing to follow health behaviors that they feel are most appropriate.

Given that current literature provides evidence that dietary and physical activity behaviors largely contribute to both mental health and physical well-being (Asztalos et al., 2009; Faulkner, 2009; McCulloch & Rylie, 2006; Monshouwer et al., 2009; Muñoz et al., 2009; Shepherd, 2009; Storey et al., 2009; Tomlinson et al., 2009), that family communication styles are associated with overall well-being of individuals (Koesten et

al., 2009; Schrodt et al., 2007), and that young-adult children's levels of conformity to learned health behavior patterns depends largely on the family communication environment that they have experienced (Baxter et al., 2005), it seems prudent to more closely examine the influence of family communication styles on the relationships of young adults' and their parents' dietary and physical activity behaviors. Research which more closely investigates how dietary and physical activity behaviors of family members may be linked in each of the three types of family communication environments is of interest in this study.

**Demographics.** Current research indicates that minority populations are at greater risk of being overweight or obese, and the increased risk could be related to the development of poor dietary and physical activity habits. Single-parent households are more common among minority populations, for example, and children of single-parent households may eat alone more frequently than eating with family (Henderson, 2007). Multiple barriers to healthful food choices are present in communities of minority status and of low-income status. Such barriers include the presence of fast-food restaurants and of low-nutrient food choices in schools, both of which are more common in communities with high poverty rates and among populations with higher concentrations of ethnic minority residents (Yancey & Kumanyika, 2007). In the urban setting, high crime rates and unsafe neighborhoods are barriers to school-aged children playing and engaging in sports activities outdoors at school, home or community parks (Yancey & Kumanyika).

Maziak et al. (2008) suggest that variables related to low socioeconomic status (SES) are associated with the prevalence of overweight conditions. In low-income,

minority communities, environmental and cultural factors could play a role in the development of poor dietary and physical activity habits (Nelson, 2007). For example, perceived dangers of playing outside discourage outdoor play and walking (Maziak et al.; Yancey & Kumanyika, 2007).

**Living status.** While living in the same household, children are likely subject to their parents' dietary and physical activity behaviors. Many intervention studies have indicated that changes in parents' dietary and physical activity behaviors influence their children's changes in dietary and physical activity behaviors (Blom-Hoffman et al., 2008; Chen et al., 2008; Haire-Joshu et al., 2008; Hunter et al., 2008; McCallum et al., 2007; Talpade, 2008). Not only do parents model behaviors for their children, they also control the availability of foods and activities in their households (Chen et al.; Haire-Joshu et al.; Hunter et al.; Talpade). There are no current studies that examine the relationships of dietary and physical activity habits of parents and their adult children who no longer live in the same household. Such research is needed to understand whether there are long-term effects of parents' dietary and physical activity behaviors on their children's development of dietary and physical activity behaviors.

### CHAPTER 3. THEORETICAL APPLICATIONS

The theory of planned behavior (TPB), social cognitive theory (SCT), social action theory (SAT), and systems theory provide frameworks for understanding the development of behaviors. The influence of parents on children's development of behaviors is seemingly represented in each of the theories.

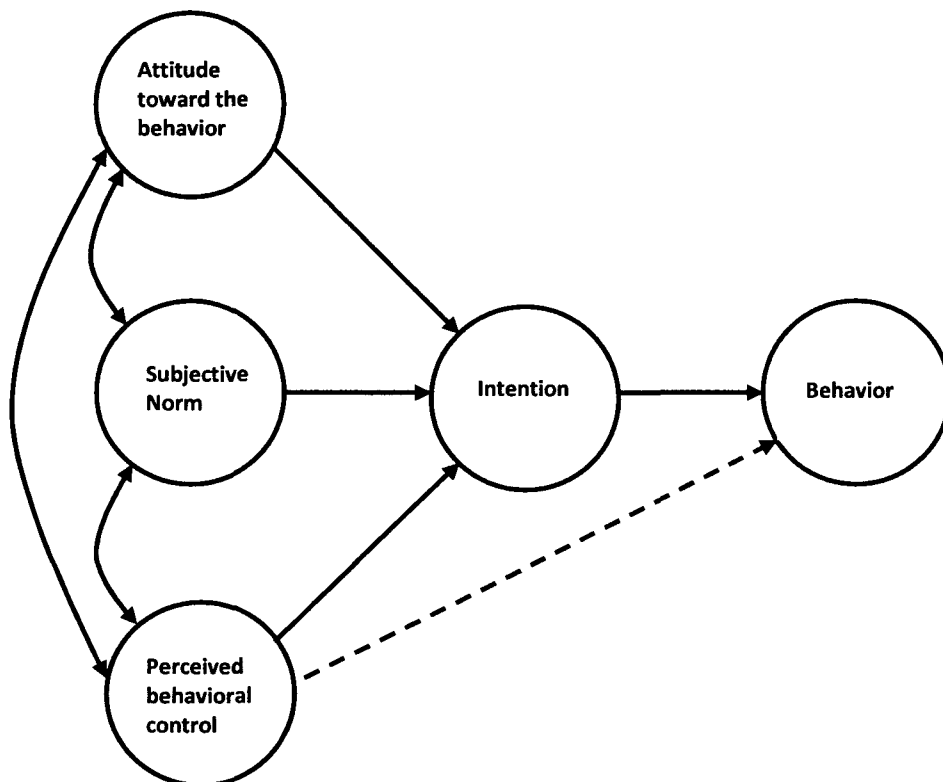
#### **Theory of Planned Behavior**

Although TPB (Ajzen, 1991) does not attempt to account for all psychological complexities and interactions which influence behavior, it does provide a model that offers a foundational and general basis for predicting intentions and behaviors. As shown in Figure 1, TPB attributes the development of one's intention to perform a behavior to three personal traits: attitude toward the behavior; subjective norm; and perceived behavioral control.

TPB does not explicitly state how the predictive variables are formulated; however, it is implicit that the variables are individual traits that are learned or otherwise inherited. An individual's attitude toward a behavior, for example, represents how the behavior is valued by her/him. Parents teach values and attitudes about behaviors to their children. As parents nurture their children, they apply personal values in order to attempt to shape their children's beliefs and behaviors. Their children eventually form their own individual perceptions and attitudes about such principles, but their perceptions are largely influenced by their parents' teachings and behaviors.

Similarly, parents help define subjective norms, the perceptions of the norms of others whom their children find significant. As children learn from their parents, they hold their parents as key mentors whom they wish to please. In addition, parents are

gatekeepers for individuals with whom their children associate. Allowing for relationships with people who hold particular subjective norms will influence the children's development of similar norms.



*Figure 1.* From “The Theory of Planned Behavior,” by I. Ajzen, 1991, *Organizational Behavior and Human Decision Processes*, 50, p. 182. Copyright 1991 by Academic Press Inc. Reprinted with permission.

Whether an individual perceives that she/he is able to engage in a behavior largely influences her/his intention to perform the behavior. Unlike the other two variables, perceived behavioral control not only influences and predicts individuals' intentions but also influences the actual behaviors directly. Parents influence their children's perceived and actual ability to perform behaviors. Parents control the

availability of foods and activities in the household, for example, as children are subject to eating foods that are purchased and prepared for them, and they are largely influenced by the activities that their parents teach, allow for and encourage. Therefore, while children are living in a household with parents, the parents largely influence the children's actual abilities to engage in behaviors. Such abilities support children's intentions, and a lack of abilities can inhibit children's behaviors even if their intentions support them.

Parents also shape children's perceived abilities. If parents do not have expectations for or confidence in their children's abilities, the children will likely develop a lack of confidence in their own abilities and, therefore, will lack motivation to attempt activities that are challenging.

Responding to hunger is oftentimes thought of as an immediate or unplanned response that is largely influenced by habit or convenience. Similarly, the decision to engage in physical or sedentary activity could be considered an unplanned response that is based on immediate perceived energy levels or habit. However, it is more likely that isolated behaviors related to eating and activity are simply individual elements that compose a pattern of behavior or lifestyle. Although present intentions are influenced by the immediate perceptions of behavioral control (which may include the current availability of food or current perceived energy levels), attitudes and subjective norms along with overall perceived behavioral control interact together with intentions to define a regular pattern of behavior. For example, individuals can plan for their healthful response to hunger prior to actually experiencing the sensation of hunger, thereby supporting their behavioral pattern of healthful eating. Further, these

individuals can resist unhealthful foods and take steps to consume nutritious foods even during events of unplanned hunger.

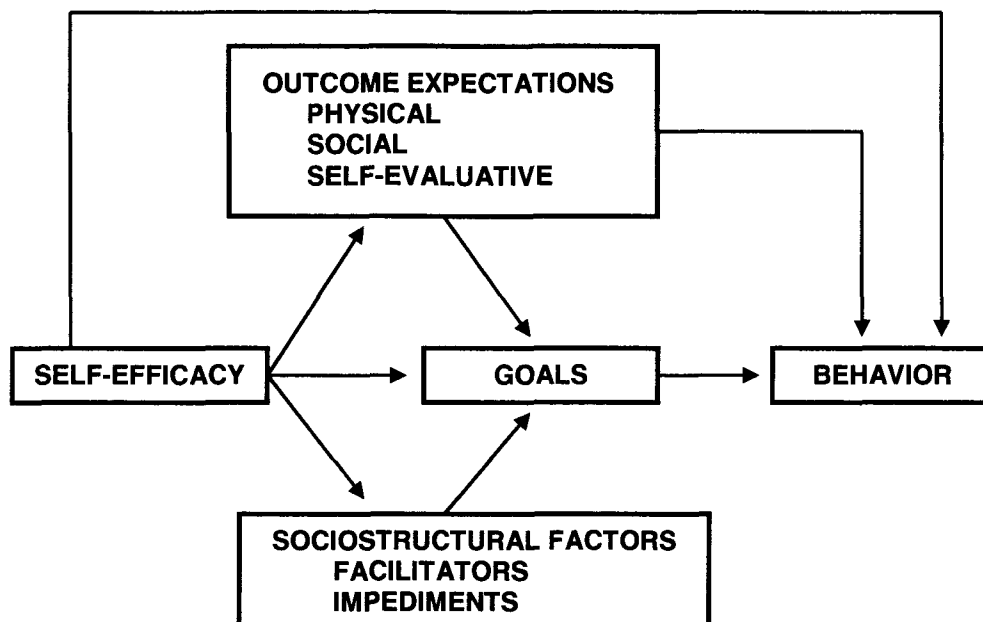
### **Social Cognitive Theory**

In SCT (Bandura, 2004), knowledge is a foundational component of behavior. When engaging in a particular behavior, individuals are aware of their purpose for doing so. Without such knowledge, individuals would simply not engage in a behavior. Making individuals aware of the various implications of behaviors is the first step to enabling them to make choices about the activities in which they choose to participate.

Once an individual becomes aware of consequences that are associated with a particular behavior, other factors weigh on her/his decision to engage in the behavior. As illustrated in Figure 2, self-efficacy directly influences behavior and also influences one's outcome expectations and sociostructural factors, and all three of these attributes collectively inspire personal goals and, ultimately, behaviors.

Self-efficacy, or the belief of an individual that she/he can produce a desired behavior and can generate a desired effect from the behavior, largely determines whether she/he will attempt the behavior. Additionally, it is self-efficacy that will help individuals overcome difficulties or setbacks, and self-efficacy is the primary source that individuals draw on during motivational experiences. Further, a behavior is largely determined by the outcomes that an individual expects it will produce. Such expected outcomes include physical effects, social consequences, and self-evaluative results which are largely based on personal standards. Barriers, or impediments, to maintaining healthful activities include personal stressors, the absence of resources needed to attain

goals and the availability of alternative activities. Facilitators that promote a healthful behavior, however, include adequate resources, motivational peers, and personal reward.



*Figure 2.* From “Health Promotion by Social Cognitive Means,” by A. Bandura, 2004, *Health Education & Behavior*, 31(2), p. 146. Copyright 2004 by SOPHE. Reprinted with permission.

Goals are specific targets that individuals establish and aim to reach by modifying their behaviors. An individual’s goals are largely determined by her/his self-efficacy or belief that she/he is capable of achieving the goal. Also, individuals set goals based on the outcomes they expect to achieve, and they consider the real or perceived barriers and opportunities that they are currently experiencing or that they anticipate they will experience when modifying their behaviors in order to reach their goals.



To engage in a healthful behavior, one must first be aware of the need for the behavior. She/he should possess a desire to achieve the behavior, have an internal locus of control, expect positive outcomes and be empowered to overcome obstacles and take advantage of motivational opportunities. In health promotion, all of these various factors must be considered and encouraged in order to motivate individuals to set personal goals to achieve the desired behaviors. Similarly, as parents teach their children the importance of healthful behaviors, they, too, must consider the complex details that motivate behavior. Parents can teach their children about the short- and long-term benefits of maintaining a nutritious diet and regular physical activity while concurrently promoting their children's self-confidence and self-efficacy. Parents can provide support for their children who face barriers to achieving desired behaviors, and they can celebrate opportunities with their children to help inspire them to set and achieve behavior goals.

### **Social Action Theory**

SAT (Ewart, 1991) suggests that individuals' circumstances are largely controlled by their behaviors. When an individual engages in a particular health behavior, the behavior alone is reinforcing and will encourage its replication. Further, sets of actions usually co-occur. An individual who participates in a healthful activity, such as eating a nutritious meal, will oftentimes also participate in additional healthful activities, such as exercise or avoiding harmful substances. This co-occurrence of reinforcing healthful behaviors contributes to the development of a lifestyle, or pattern of behavior, that contributes to one's quality of life.

Undesirable habits are also reinforcing and are therefore difficult to overcome and usually accompany additional undesirable behaviors. To successfully rid oneself of undesirable habits that contribute to an unhealthy lifestyle, an individual could take advantage of the reinforcing and co-occurring nature of behaviors by incrementally incorporating desirable behaviors into her/his current lifestyle.

Individuals attempt behavior change once they have appraised that a particular behavior is undesirable and that they have the motivation to change it. They then choose to regulate the target behavior and devise problem-solving strategies to do so. Both external and internal stimuli can potentially interfere with successful behavior change, and when they do, individuals will likely reevaluate the behavior, their motivation, and the strategies with which they will reattempt behavior changes.

Planning effective strategies to change a behavior requires skill and knowledge about the behavior. Those who are knowledgeable about the benefits of a healthful diet and regular physical activity and who are aware of the risks associated with unhealthy eating and sedentary activity are more capable of creating an effective personal strategy to develop healthful diet and activity habits. General problem-solving skills also contribute to one's ability to successfully change an unwanted behavior, and physical environments can aid in successfully achieving a desired behavior. Personal values and social norms must also align with the behavior in which an individual attempts to regularly engage.

An expected desirable outcome is a vital component that is necessary to influence behavior change, and the desirable outcome will actually increase one's motivation to change. Decreased health risks, improved physical appearance and

enhanced social relationships, for example, will encourage one's desire to improve her/his eating and physical activity behaviors.

Despite realizing desired outcomes of a new behavior, an individual cannot successfully change in the absence of self-efficacy. Individuals who lack self-efficacy, however, can take steps to improve their self-efficacy levels. Since achieving goals is a reinforcing behavior, an individual can set smaller, more easily attainable goals. Once the smaller goals have been reached, she/he will experience self-satisfaction, a resultant boost in self-efficacy and an increased motivation to continue to reach for positive goals. The larger goal will eventually be perceived as more realistic and attainable.

Personal behavior patterns are related to the social norms established by friends, family members and other acquaintances. Members of the same household, for example, usually participate in similar activities, and friends and coworkers oftentimes share behavior patterns. Moreover, those in a relationship have strong influences on one another's behaviors and success at changing behaviors.

Healthful dietary and physical activity behaviors, like all behaviors, are reinforcing and can naturally co-occur. To facilitate the co-occurrence of healthful behaviors, parents can help their children develop problem-solving skills, an awareness of dietary and physical activity implications and an understanding of the outcomes of such behaviors. Parents can help boost children's self-efficacy and encourage environments with healthful social norms and supports.

### **Systems Theory**

In 1967, Watzlawick, Beavin, and Jackson expanded on a concept of family homeostasis (Jackson, 1957) and employed a theory of systems (Miller, 1965) to

describe communication and interaction of family members (p. 118-148). According to Watzlawick et al. (1967), the systems perspective of families represents the interrelationship of family members; individuals within a family depend on and are dependent on one another. Actions of all individuals collectively establish the family's culture or norms, and the conventional family norms influence the norms of each individual. Both the short- and long-term behavior patterns of each family member are dependent upon the behavior patterns of the other family members. In 1986, Galvin and Brommel further provided evidence that the interdependence of family members, as described by systems theory, is so strong that it has long-lasting effects and influences family patterns for future generations.

According to Galvin and Brommel (1986), systems theory also illustrates the natural pattern of behaviors that form within a family to make life predictable and manageable. Individuals follow family rules which are understood, and whether or not a particular behavior is acceptable depends on whether it follows the usual family pattern. If a family member engages in an activity that diverts from the family's norm, an underlying sense of awkwardness from other family members will emerge, even if the activity is equivalent to or an improvement of the current norm. The new behavior will become acceptable by family members only after a new norm or family rule is established.

The family system influences the patterns of dietary and physical activity behaviors among the individual family members. As parents establish dietary and physical activity norms for their families, they help shape their children's lifelong dietary and physical activity behaviors. If a family culture supports healthful eating and

regular physical activity, for example, the children will not only be encouraged to follow the healthful lifestyle patterns, they will be discouraged to divert from them. Further, they will carry the learned norms throughout their lifetime and will eventually establish similar norms in their own families.

### **Overview of Theories**

The theory of planned behavior (TPB), social cognitive theory (SCT), social action theory (SAT) and systems theory similarly describe the emergence of behaviors. However, they each represent a distinct focus on particular factors that contribute to behavior.

Just as TPB illustrates the influence of one's *perceived behavioral control* on her/his *subjective norms*, *attitude toward the behavior* and ultimately her/his *intentions*, SCT represents the effect of one's *self-efficacy* on her/his *sociostructural factors*, *outcome expectations* and *goals*. Both theories represent the significance of an individual's belief in her/his capability to perform a behavior. In addition, both TPB and SCT illustrate the influence of the personal belief on other significant factors that also influence the desire to perform a particular behavior. Further, SAT provides a model that suggests that *self-efficacy* must be present in order to stimulate motivation for an individual to engage in a particular behavior.

All models help define how norms influence an individual's behavior. In TPB, one's *subjective norms*, or her/his perception of the norms of others, influence her/his *intention* to engage in a behavior and also affect the other significant factors that influence *intention*. In SCT, an individual's perceived social consequences and personal standards are components of her/his *outcome expectations* which influence the

individual's *goals*. In SAT, behavior patterns are related to social norms, and the social norms influence the desire to perform in a particular behavior. Systems theory illustrates that family norms set the pace for individual norms, and it further describes that individual family members' behaviors influence and are influenced by other family members' behaviors.

Although TPB and SAT suggest that one's norms influence both her/his intent to perform a behavior *and* other significant factors, SCT illustrates that norms only influence the development of *goals* and the related behavior. Further, opportunities and barriers that make up the *sociostructural factors* in SCT only influence *goals* and have no effect on other factors that influence behavior. The one-way relationships and greater focus on *self-efficacy* represented by SCT suggests that *self-efficacy* is a sole significant influence on all factors which contribute to personal behaviors. While other factors also influence *goals* to engage in a behavior, they do not communally interact to affect behavior. In TPB and SAT, *self-efficacy*, or *perceived behavioral control*, is recognized; however it is represented as one factor that interacts mutually with other factors to affect behavior. Further, TPB is especially representative of the collective and interactive effects of factors which contribute to one's *intention* of performing a behavior, as *all* personal and social components represented by TPB interact.

SAT represents the reinforcing nature of behavior patterns, both TPB and SCT demonstrate only finite beginning- and end-points of behaviors, and systems theory represents the cyclical interrelationships of behaviors within family systems. SAT illustrates that particular behaviors co-occur, while TPB and SCT represent only the occurrence of and influences on single behaviors. The reinforcing and co-occurring

patterns of behaviors that are represented in SAT emerge as additional implicit factors that influence behavior, and such implicit factors are not provided in TPB, SCT and systems theory.

In conclusion, TPB, SCT, SAT, and systems theory similarly portray the influence of personal and social factors that contribute to the development of behaviors. TPB most strongly represents a mutual relationship of the factors, while SCT establishes the principal influence of self-efficacy, SAT provides additional considerations for the nature of behavior, and systems theory pulls together the relationships of individual and family behavior patterns. All four theories provide effective models for understanding individuals' patterns of dietary and physical activity behaviors, and they each offer frameworks that can aid in the development of successful behavioral interventions.

When considering the development of children's dietary and physical activity behaviors and their relationship to parental influences, it would be appropriate to integrate TPB, SAT and systems theory. Systems theory provides a foundational concept of families' influence on individual behavior patterns, how family members' behaviors are influenced by one another and how family norms influence the family and also carry over into families of succeeding generations.

TPB suggests that one's *perceived behavioral control*, *subjective norms* and *attitude toward the behavior* are interrelated and affect her/his *intention*. It is reasonable to regard a child's *perceived behavioral control* as one factor that affects *subjective norms* and *attitude toward the behavior*, as the child's perceived or actual ability to engage in a behavior will lead to the development of personal behavior patterns,

personal norms, preferences of friends and attitudes about the value of attempting particular behaviors.

Similarly, a child's *subjective norms* affect her/his development of *perceived behavioral control* and *attitude toward the behavior*. The environment and related norms that she/he is subject to during childhood will influence not only her/his real or perceived ability to engage in a behavior, they will also affect her/his attitude about whether performing a behavior is worthwhile or aligns with her/his personal beliefs.

Finally, a child's *attitude toward the behavior* will influence her/his development of *subjective norms* and *perceived behavioral control*. Children will eventually associate with others who hold values similar to their own. Also, their perceived ability to perform a behavior will be influenced by their beliefs that the effort to perform a behavior is valuable and will result in desired effects.

TPB further illustrates parents' direct influence on children's behavior. *Intention* and *perceived behavioral control* ultimately determine an individual's *behavior*; therefore, parents directly influence their children's behavior by simply making resources available or unavailable or by allowing or disallowing activities. Parents ultimately control whether or not their children will engage in a behavior by directly affecting their *perceived behavioral control*.

SAT indicates that performing a behavior is, in itself, reinforcing. If a child engages in a behavior, the behavior alone will influence her/his development of *perceived behavioral control*, *subjective norms* and *attitude toward the behavior* to ultimately influence her/his *intention* to repeat the behavior in the future. In addition,



SAT suggests that behaviors co-occur. A particular behavior will influence other behaviors.

For example, if a child participates in a healthful level of physical activity, the physical activity alone will reinforce her/his *perceived behavioral control* that she/he can perform the physical activity in the future. Also, the child's *subjective norms* will be affected, as she/he will be more likely to associate with others who engage in similar physical activity behaviors. The *attitude toward the behavior* will also be influenced, as the child will develop stronger beliefs about physical activity and its value. In addition, since behaviors co-occur, the child's *perceived behavioral control*, *subjective norms* and *attitude toward the behavior* of eating healthfully will be reinforced in a similar fashion.

Parents' behaviors, attitudes and environments that they help create significantly influence their children's behavior patterns related to diet and physical activity. Family norms are created by parents, and the development of children's diet and physical activity behaviors is largely influenced by the norms. Parents affect their children's perceived and actual ability to perform these behaviors, as they control the availability of foods and activities in the household. Further, children are influenced by the activities that their parents teach them and establish as valuable. Parents also shape their children's perceived abilities, as children develop a level of confidence that is consistent with their parents' expectations and confidence in them. Additionally, parents set the stage for *subjective norms*, as they teach children about the acceptability of particular behaviors, and they control with whom their children associate. Parents influence children's personal beliefs and perceptions of the value of engaging in particular behaviors. Moreover, as parents simply allow for their children to participate in a

particular behavior, they actually encourage the behavior along with other similar behaviors. Ultimately, parental influences collectively support cycles or patterns of behaviors in children.

## CHAPTER 4. AIMS OF THIS STUDY

Establishing healthful dietary and physical activity habits during childhood is necessary not only for the health and well-being of children but also their continued healthful habits throughout adulthood (USDHHS, 2000, 2011). Appropriate amounts of physical activity and a balanced diet are necessary for healthy growth, and the USDHHS has created a national objective to improve accessibility of weight-related health promotion opportunities for all population groups (USDHHS, 2011).

Current literature suggests that parent participation in children's and adolescents' weight-related health interventions contributes to intervention success (see *Introduction*). Further, theoretical models describe the contribution of parental standards to the development of children's lifelong behaviors. Therefore, the aim of the current study is to further explore the relationships of parents' and their children's weight statuses, dietary behaviors and physical activity behaviors and the effects of parental authority, family communication environments and demographic characteristics.

### **Hypotheses**

The theories discussed provide insight on the development of individuals' behaviors and support the notion that parents' behaviors influence the development of their children's behaviors. However, current literature that examines the relationships of both dietary and physical activity habits of parents and their children is limited. This study will gather and analyze empirical evidence to test the theories in the context of dietary and physical activity behavior development and will also explore the relationships of parents' and their children's weight statuses. Weight statuses and

behaviors of young adults and their parents will be examined to test the following hypotheses:

Hypothesis #1: Weight statuses, dietary behaviors, and physical activity behaviors of young adults are not significantly different from weight statuses, dietary behaviors, and physical activity behaviors of their parents.

Hypothesis #2: Weight statuses, dietary behaviors, and physical activity behaviors of young adults are positively correlated with weight statuses, dietary behaviors, and physical activity behaviors of their parents.

### **Research Questions**

Multiple empirical studies have suggested that children are subject to their parents' dietary and physical activity behaviors (Blom-Hoffman et al., 2008; Chen et al., 2008; Haire-Joshu et al., 2008; Hunter et al., 2008; McCallum et al., 2007; Talpade, 2008). Also, a wealth of literature suggests that demographic characteristics influence dietary and physical activity behaviors of individuals (Henderson, 2007; Kirchengast & Marosi, 2008; Nelson, 2007; O'Dea & Caputi, 2001; Ogden et al., 2006; Price, Day, & Yorgason, 2009; Yancey & Kumanyika, 2007). Current literature examines the relationships of young adults' health behaviors and the parenting styles of their parents (Arehart-Treichel, 2007; Enten & Golan, 2007, 2009; Lohaus et al., 2009; Rhee, 2008; Rhee et al., 2006). Associations between family communication and overall well-being of individuals has been established (Koesten et al., 2009; Schrodt et al., 2007), and current literature suggests that young-adult children's levels of conformity to learned health behavior patterns depend largely on the communication environments they experienced (Baxter et al., 2005). However, literature which evaluates demographic

characteristics, parenting styles and family communication environments as moderators of the relationships of parents' and their children's BMIs, dietary behaviors and physical activity behaviors does not exist. To begin to fill this gap, the following research questions will be addressed in the current study:

Research Question #1: Do former parenting styles or family communication environments moderate the relationships between parents' weight statuses, dietary behaviors, and physical activity behaviors and those of their young adult children?

Research Question #2: Do demographic characteristics moderate the relationships between parents' weight statuses, dietary behaviors, and physical activity behaviors and those of their young adult children?

## CHAPTER 5. METHODS

### Participants

A total of 151 young adults, aged 18 to 25 years ( $M = 19.1$ ,  $SD = 1.4$ ), and one parent of each of them participated in this study after responding to an invitation that had been distributed throughout an Upper Midwest region. Almost all young adult participants were full-time students (99.3%,  $N = 145$ ). Most were freshmen and sophomores (85.4%,  $N = 129$ ), and most young adult participants attended North Dakota State University (96.0%,  $N = 145$ ). Three young adult participants attended the University of Minnesota (2.0%), one attended the North Dakota State College of Science (0.7%), one attended an additional local technical college (0.7%), and one did not attend college (0.7%). Since the samples for most of the study locations were very small, the data for each study location were combined into one sample for analyses.

Young adult participants included 92 females, 58 males, and one who did not specify, and most were white (88.7%,  $N = 134$ ). Most young adult participants spent a majority of their childhood and adolescence living at home with both biological parents (81.5%,  $N = 123$ ). Other young adult participants lived with a single parent (9.9%,  $N = 15$ ), a parent and stepparent (6.0%,  $N = 9$ ), two adoptive parents (2.0%,  $N = 3$ ) or extended family members (0.7%,  $N = 1$ ).

Almost all young adult participants had never been married (99.3%,  $N = 150$ ), and many no longer lived with their parents (90.1%,  $N = 136$ ). Instead, most young adult participants lived in college housing (67.5%,  $N = 102$ ) or rented a home (21.9%,  $N = 33$ ).

Each parent participant was considered by their young adult child participant to be the parent that has been primarily responsible for their families' grocery purchases and activities. Parent participants were aged 36 to 64 years ( $M = 48.5$ ,  $SD = 5.3$ ) and consisted of 130 females and 21 males. Most parent participants were white (92.1%,  $N = 139$ ).

### **Procedures**

The study invitation was placed in two Upper Midwestern newspapers, the *Forum* of Fargo, ND and Moorhead, MN (<http://www.inforum.com/>) and the *Daily News* of Wahpeton, ND and Breckenridge, MN (<http://www.wahpetondailynews.com>). Study invitations were also sent via email to students at the following Upper Midwestern community college and universities:

1. North Dakota State College of Science (NDSCS), located in Wahpeton, ND. NDSCS is a comprehensive 2-year college with over 80 academic options for students (NDSCS, 2010). In Fall-2010, a total of 2,833 students were enrolled ("NDSCS enrollment hits 25-year high," 2010).
2. North Dakota State University (NDSU), located in Fargo, ND. NDSU is a public university consisting of 106 undergraduate programs (NDSU, 2009) and, in Fall-2010, enrolled 11,977 undergraduate students and 2,084 graduate students ("Record college enrollments in North Dakota," 2010).
3. University of Minnesota, Department of Communication Studies, located in Minneapolis, MN. The Department of Communication Studies enrolls over 600 undergraduate students and approximately 50 graduate students who

seek degrees in Communication Studies (“Department of Communication Studies,” 2009).

Young adults and their parents initiated the study directly by accessing the study’s introductory webpage and online questionnaires. Detailed information about the study was provided on the introductory webpage and, upon accessing a separate webpage to automatically generate unique login information, each participant was directed to the study’s online consent letter (Appendix B) and questionnaires. For those participants who preferred to complete the study with hard copy documents, study information, a consent letter, and study questionnaires were sent via postal mail along with a postage-paid return envelope. The researcher followed up with participants as needed to help ensure study completion and to answer questions.

As an incentive to encourage prompt completion of study questionnaires, a personalized nutrition profile was made available to participants immediately upon completing the questionnaires. For participants who completed the study by mail, a personalized nutrition profile was mailed within 10 days of receiving each completed study.

The study was approved by NDSU’s *Institutional Review Board*. Also, the other participating college and university provided letters indicating permission to send study invitations to their students.

## **Measures**

Both young adult and parent participants completed the Block Brief Food Frequency Questionnaire (FFQ) (Appendix C), an adaptation of the Global Physical Activity Questionnaire (GPAQ) (Appendix D), and demographics questionnaires



(Appendix E and F). In addition, each young adult participant completed the Parental Authority Questionnaire (PAQ) (Appendix G) and the Communication Environment Instrument (CEI) (Appendix H).

**Block Brief Food Frequency Questionnaire.** In 2005, Boucher et al. proposed that food frequency questionnaires are the economical and practical means to collect data on dietary intake patterns in population-based studies. The Block Brief Food Frequency Questionnaire is a condensed version of the previously validated full-length Block Food Frequency Questionnaire. Responses to the Block Brief FFQ can be entered by participants into the online survey system to estimate characteristics of usual dietary consumption of food items, dietary supplements and low-fat food alternatives. In addition, the survey administrator has the option to set the system to automatically generate a personalized nutrition profile for the participant immediately following completion. The profile is based on the participant's FFQ responses and national dietary guidelines.

Both the Block Brief and full-length questionnaires were validated against three four-day records in the Women's Health Trial Pilot (Block, Hartman, & Naughton, 1990). In the "Usual Diet" participant group, the full-length FFQ correlated at  $r = 0.57$  with multiple dietary records, and the condensed questionnaire correlated at  $r = 0.56$ . In the "Low Fat" participant group (a group trained to reduce their fat intake), the correlation of the full FFQ with records was  $r = 0.62$ , and the correlation of the condensed FFQ with the dietary records was  $r = 0.65$ . This suggests that the condensed Block Brief FFQ is comparable to the full-length version.

Subar et al. (2001) used a measurement error model developed by Freedman, Carroll, and Wax (1991) to find deattenuated correlations ( $p$ ) among the estimated truth and the Block Food Frequency Questionnaire (FFQ), Diet History Questionnaire (DHQ) and Willett FFQ. Participants, aged 20-70 years, consistently underreported absolute energy intakes on all three questionnaires. The correlations of the Block FFQ estimates of energy consumption with estimated truth were  $p = 0.45$  for both female and male participants, the correlation of DHQ estimates of energy consumption with estimated truth was  $p = 0.48$  for female participants and  $p = 0.49$  for male participants, and correlations of the Willett FFQ were  $p = 0.18$  for female participants and  $p = 0.20$  for male participants. Questionnaire results were adjusted for reports of energy consumption, and the correlations of both the Block FFQ and the DHQ were similar both before and after adjusting for energy consumption. Previous reports indicate that the Block FFQ, in multiple versions, is a reliable indicator of energy and nutrient consumption (Block, Woods, Potosky, & Clifford, 1990; Boucher et al., 2006; Mares-Perlman et al., 1993).

The Block Brief FFQ is used in this study to examine participants' dietary behaviors, as measured by average calories consumed per day. Correlation analyses are used to assess similarities of young adult and parent participants' average calories consumed per day, and paired samples t-tests are used to explore the differences of calories consumed between young adults and their parents.

**Global Physical Activity Questionnaire.** The GPAQ consists of 16 questions that assess usual weekly energy expenditure among individuals. It was developed by scientists at the World Health Organization as part of a comprehensive approach to

assess and monitor chronic disease risk factors in multiple countries (Armstrong & Bull, 2006). The GPAQ, along with the accompanying pre-set data analysis tools, can be used to estimate weekly metabolic equivalents (METs), a unit of measure for energy expenditure that controls for intensities of physical activities. Version 1 of the GPAQ was tested in nine countries by comparing it with the International Physical Activity Questionnaire (IPAQ), a tool previously found to be valid (Craig, 2003; Ekelund, Sepp, & Brage, 2006; Hagstromer, Oja, & Sjostrom, 2006; Hallal & Victora, 2004; Vandelanotte, De Bourdeaudhuij, Philippaerts, Sjöström, & Sallis, 2005). The GPAQ activity measures and sedentary measures were moderately correlated with the IPAQ ( $r = 0.54$  and  $r = 0.65$ , respectively), and the GPAQ appears to have good test-retest reliability ranging from  $r = 0.67$  to  $r = 0.81$  (Armstrong & Bull). The GPAQ has since been revised slightly, as recommended by representatives of the World Health Organization and U. S. Centers for Disease Control and Prevention, to reduce redundancy; however, the revised version of GPAQ maintains the same structure and format of the original GPAQ (Armstrong & Bull).

The GPAQ (version 2) is typically used as an oral questionnaire. For this study, it was adapted slightly for use as a self-administered questionnaire. The questions were not changed; however, interviewer instructions were removed (see Appendix D).

Correlations of responses among young adults and parents are measured to assess for similarities of usual physical activity behaviors, and paired samples t-tests are used to explore the differences of energy expended between young adults and their parents.

To compare the levels of perceived pleasure of physical activity, a measure of physical activity enjoyment is assessed with a question described by Davison and Birch

(2002) (see Appendix D). Participants used a 3-point scale to rank the level at which the statement, “I exercise for fun,” describes them, with 1 = “Does not describe me” and 3 = “Really describes me.” Although validity for this measure has not been established and the reliability of a one-item measure is typically considered questionable, some studies suggest that one-item measures could be more reliable than was once generally considered (Dollinger & Malmquist, 2009; Milton, Bull, & Bauman, 2007; Wanous & Reichers, 1996). Since one’s perceived pleasure of engaging in physical activity helps describe her/his related intention of physical activity behaviors, responses to this measure are of interest in this study.

**Parental Authority Questionnaire.** The PAQ is a 30-item questionnaire that was developed by Buri (1991) to measure parents’ authority types described by Baumrind (1971). The PAQ consists of three 10-item scales that measure authoritative, authoritarian, and permissive parenting styles. Buri developed and administered two versions of the PAQ. The items on each version were identical, except one version referred to mothers’ characteristics, and the other version referred to fathers’ characteristics. Only the words “mother” and “father” were interchanged on the two versions. Both versions were administered to high-school and college student participants to test the three PAQ scales for reliability and validity of mothers’ and of fathers’ parenting styles. A total of six scales were tested (mothers’ authoritative scale, mothers’ authoritarian scale, mothers’ permissive scale, fathers’ authoritative scale, fathers’ authoritarian scale and fathers’ permissive scale). All scales appear to have good test-retest reliability, ranging from  $r = .77$  to  $r = .92$ , and good internal consistency reliability, ranging from  $r = .74$  to  $r = .87$  (Buri).

In addition, discriminant-related validity testing indicated that the permissiveness and authoritative scales were inversely related to the authoritarianism scales, as one would expect, ranging from  $r = -.38$  to  $r = -.52$  ( $p < .0005$  for all relationships). Further, the permissiveness scales were not significantly related to the authoritative scales ( $r = .07$  and  $r = .12$ ,  $p > .10$  for both relationships).

Criterion-related validity testing revealed significant bivariate correlations between PAQ scores and the previously validated Parental Nurture Scale (Buri, Misukanis, & Mueller, 1988), indicating a reasonable relationship between parental authority and parental warmth. High authoritative scale scores also were associated with high parental nurture scores ( $r = .56$  and  $r = .68$ ,  $p < .0005$  for both relationships), and high authoritarian scale scores had inverse relationships with parental nurture scores ( $r = -.36$  and  $r = -.53$ ,  $p < .0005$  for both relationships). High permissive scale scores were not related to nurture ( $r = .04$  and  $r = .13$ ,  $p > .10$  for both relationships). Also, bivariate correlations between PAQ scales and the previously validated Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1964) were not significant, indicating that PAQ is not vulnerable to socially acceptable response bias.

The PAQ was adapted to include the word “parents” instead of “mother” or “father,” and it was administered to the young adult participants (see Appendix G) in order to examine whether young adults’ perceptions of their parents’ authority types moderate the relationships of young adults’ and their parents’ BMIs, dietary behaviors and physical activity behaviors. Young adult participants described their parents’ styles by using a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) for each item

on the three 10-item scales. For each participant, the ratings of items were averaged to compute scores for authoritative, authoritarian and permissive parenting styles.

**Communication Environment Instrument.** Fitzpatrick and Ritchie (1994) developed the CEI by merging concepts from research on marital types and research on family communication schemata. The CEI is a 25-item scale instrument that assesses participants' perceived family communication environments as *expressive*, *structural traditionalism* and *conflict avoidance* environment types.

Baxter et al. (2005) validated the instrument with maximum likelihood confirmatory factor analyses, which found a reasonable fit (GFI = .88, RMSEA = .06). GFI indicates the levels of variances and covariances in the sample that are due to the model being tested. A close fit is indicated as GFI values approach .90. RMSEA, or the root mean squared error of approximation, indicate a reasonable fit if values fall between .05 and .08 and a close fit if values fall under .05.

The CEI was administered to the young adult participants (see Appendix H) in order to examine whether family communication environments moderate the relationships of young adults' and their parents' BMIs, dietary behaviors and physical activity behaviors. Student participants described their families' communication environments using a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) for each item. For each participant, the ratings of items were averaged to compute scores for structural traditionalism, conflict avoidance and expressive communication environments.

## **Data Analysis**

All questionnaire data were analyzed with the *SPSS* statistical software package, version 17.0. Measures of BMI, average daily energy consumption, average weekly energy expenditure and physical activity enjoyment were considered separately to compare parents' and children's weight statuses, dietary behaviors and physical activity characteristics and to further examine the relationships of PAQ scores, CEI scores and demographics as moderators.

**Hypothesis #1.** Paired-samples t-tests were conducted to examine the similarity of the means of children's and parents' BMI scores, daily energy consumption, weekly energy expenditure and physical activity enjoyment. The following hypothesis was tested: Weight statuses, dietary behaviors, and physical activity behaviors of young adults are not significantly different from weight statuses, dietary behaviors, and physical activity behaviors of their parents.

**Hypothesis #2.** Correlation analyses were used to assess the rank-order similarity of children's and parents' BMI scores, daily energy consumption, weekly energy expenditure and physical activity enjoyment. The following hypothesis was tested: Weight statuses, dietary behaviors, and physical activity behaviors of young adults are positively correlated with weight statuses, dietary behaviors, and physical activity behaviors of their parents.

**Research Question #1.** Authoritative, authoritarian, and permissive parenting style scales were computed as averages of their respective items. Additionally, expressive, structural traditionalism, and conflict avoidance family communication scales were computed as averages of their respective items. Interaction terms for the

PAQ scales and the CEI scales were also created. Each scale was first centered by subtracting out the mean; then, a product term was computed and included the centered scale of interest and a related centered variable of interest. Each of the PAQ scales was inserted into a regression equation as a main effect and interaction term to analyze the moderating effects of parenting styles on the relationships of parents' and their young adult children's BMIs, daily energy consumption, weekly energy expenditure and physical activity enjoyment. Also, each of the CEI scales was inserted into a regression equation as a main effect and interaction term to analyze the moderating effects of family communication environments on the relationships of parents' and their young adult children's BMIs, daily energy consumption, weekly energy expenditure and physical activity enjoyment. The analyses answer the research question: Do former parenting styles or family communication environments moderate the relationships between parents' weight statuses, dietary behaviors, and physical activity behaviors and those of their young adult children?

**Research Question #2.** Children's and parents' demographic data were considered as moderators in the relationships of parents' and their young adult children's BMIs, daily energy consumption, weekly energy expenditure, and physical activity enjoyment. The assessment includes parents' and their adult children's BMIs, daily energy consumption, weekly energy expenditure, and physical activity enjoyment, and considerations are made for parents' ages, genders, education levels, and household income levels and children's ages and genders. The analysis answers the research question: Do demographic characteristics moderate the relationships between parents'



weight statuses, dietary behaviors, and physical activity behaviors and those of their young adult children?

**Power analysis.** To determine the minimum sample size needed for testing multiple correlation in regression analysis, the following formula was employed:  $N = 50 + 8 * (\text{number of independent variables})$  (Tabachnick & Fidell, 2007, p. 123), indicating 130 young adult/parent pairs are needed ( $130 = 50 + 8 * 10$ ). To find the minimum sample size needed for testing individual predictors in regression analysis, the following formula was used:  $N = 104 + (\text{number of independent variables})$  (Tabachnick & Fidell, p. 123), indicating 114 young adult/parent pairs are needed ( $114 = 104 + 10$ ). Further, consideration of the minimum sample size needed for paired samples t-tests was based on recommendations by Stevens (2009) which indicate 45 pairs of participants are needed for a medium effect size ( $r = .30$ ), assuming a .05 alpha (p. 430). The sample size of 151 young adult/parent pairs is considered appropriate for all of the analyses conducted in the current study.

## CHAPTER 6. RESULTS

### Sample Characteristics and Attrition

A total of 151 pairs of young adults and their parents participated in this study. BMI for the young adult participants ranged from 16.8 to 40.9 kg/m<sup>2</sup>, and the mean BMI was 23.3 (*SD* = 3.9) kg/m<sup>2</sup>. According to the Centers for Disease Control and Prevention BMI categories (USDHHS, 2011), 69.5% (*N* = 105) of the young adult participants had a normal weight status (BMI range 18.5 to 24.9 kg/m<sup>2</sup>), 4.6% (*N* = 7) were underweight or very underweight (BMI less than 18.5), and 25.8% (*N* = 39) were overweight or obese (BMI at 25 kg/m<sup>2</sup> and above). Average weight status, measured by BMI, for 18 to 24 year olds in the U.S. population are summarized by Schoenborn and Adams (2010) as follows: 54.3% are of healthy weight, 3.8% are underweight, and 41.8% are overweight or obese. Relatively fewer young adult participants in this study were overweight or obese when compared to the national averages, and more young adult participants had a healthy weight status.

Parent participants' BMI range was 16.3 to 59.4 kg/m<sup>2</sup>. The mean BMI was 27.6 (*SD* = 6.2) kg/m<sup>2</sup>; 35.8% (*N* = 54) of parent participants had a normal weight status, 0.7% (*N* = 1) were very underweight, and 63.6% (*N* = 96) were overweight or obese. Schoenborn and Adams (2010) summarize the average weight status, measured by BMI, for 45 to 64 year olds in the U.S. population as follows: 30.7% are of healthy weight, 1.1% are underweight, and 68.2% are overweight or obese. Similar to the young adult participants, when comparing national averages, fewer parent participants were overweight or obese and more parent participants had a healthy weight status, although the difference was only slight.

An additional 24 young adult participants, aged 18 to 24 years ( $M = 19.5$ ,  $SD = 1.7$ ) completed all or part of the study, although their parents did not begin the study. Half of these young adult participants were female ( $N = 12$ ), and a majority were white (79.2%,  $N = 19$ ). The average BMI for these participants was 22.5 ( $SD = 3.2$ )  $\text{kg/m}^2$ ; 66.7% ( $N = 16$ ) were of normal weight, 8.3% ( $N = 2$ ) were underweight, and 20.8% ( $N = 5$ ) were overweight. One (4.2%) of these young adult participants did not report bodyweight information.

Also, nine additional parent participants, aged 38 to 56 years ( $M = 47.4$ ,  $SD = 5.2$ ), completed all or part of the study, although their young adult children did not begin the study. Of these parent participants, six (60%) were female, eight (88.9%) were white, and the average BMI was 19.2 ( $SD = 4.1$ )  $\text{kg/m}^2$ . Four of these parent participants were of normal weight (44.4%), while five were overweight or obese (55.5%).

The non-pair participants were excluded from further analyses. The excluded non-pair young adult participants tended to include more Asians and males. Similarly, the excluded non-pair parent participants tended to include more Asians and males, and, on average, they had lower BMIs than the participants who were included in further analyses. See Tables 5 and 6 for a comparison of characteristic data of the study samples.

Of the 151 participant pairs, seven ended their participation prior to completing the FFQ. The young adults of these pairs were aged 18 to 25 ( $M = 20.4$ ,  $SD = 2.2$ ), and four (57.1%) were female. Two (28.6%) were white, while four (57.1%) were Asian and one (14.3%) was Native American. The parent participants of the pairs that did not

Table 5

*Characteristics of Young Adult Samples*

Sample	Mean Age (SD)	Gender (%)		Race (%)							Former Living Status (%)						Mean BMI (SD)	
		F	M	HL	Wh	NA	AA	As	BR	NR	BB	BA	SP	PS	PG	EF		NR
Young Adults included in analyses (N = 151)	19.1 (1.4)	60.9	38.4	0.7	88.7	0.0	1.3	4.6	4.0	0.7	81.5	2.0	9.9	6.0	0.0	0.7	0.0	23.3 (3.9)
Young Adults without Parent participants (excluded from analyses) (N = 24)	19.5 (1.7)	50.0	50.0	0.0	79.2	0.0	0.0	12.5	4.2	4.2	66.7	0.0	4.2	12.5	8.3	0.0	8.3	22.5 (3.2)

Note: F = Female; M = Male; HL = Hispanic/Latino; Wh = White/Caucasian; NA = Native American; AA = African American; As = Asian; BR = Biracial; NR = No response; BB = Lived with both biological parents; BA = Lived with two adoptive parents; SP = Lived with a single parent; PS = Lived with a parent and stepparent; PG = Lived with a parent and grandparent; EF = Lived with extended family members.

Table 6

*Characteristics of Parent Samples*

	Mean Age (SD)	Gender (%)		Race (%)								Mean BMI (SD)
		F	M	HL	Wh	NA	AA	As	Ot	BR	NR	
Parents included in analyses (N = 151)	48.5 (5.3)	86.1	13.9	0.0	92.1	0.0	1.3	4.0	0.0	2.0	0.7	27.6 (6.2)
Parents without Young Adult participants (excluded from analyses) (N = 9)	47.4 (5.2)	60.0	40.0	0.0	88.9	0.0	0.0	11.1	0.0	0.0	0.0	19.2 (4.1)

Note: F = Female; M = Male; HL = Hispanic/Latino; Wh = White/Caucasian; NA = Native American; AA = African American; As = Asian; Ot = Other; BR = Biracial; NR = No response.

complete the FFQ were aged 46 to 63 ( $M = 51.3$ ,  $SD = 6.4$ ), and five (71.4%) were female. Four (57.1%) were white, and three (42.9%) were Asian. Of the entire sample, a large majority (88.7%) were white, while a large percentage of both young adult and parent participants of pairs who did not complete the FFQ were of minority races.

Two additional young adult participants did not complete the GPAQ. Both of these young adult participants were aged 19, one was a white female and the other was an African-American male. Two additional young adult participants, one aged 18 and the other aged 21, did not complete the PAQ. Both young adult participants who did not complete the PAQ were white; one was female and the other male.

Additionally, eight young adult participants, aged 18 to 21 ( $M = 18.9$ ,  $SD = 1.2$ ) did not complete the CEI. Of these, six (75.0%) were female and seven (87.5%) were white. Six additional parent participants, aged 40 to 64 ( $M = 56$ ,  $SD = 9.7$ ), did not complete the FFQ. Five (83.3%) were female, and all (100%) were white.

### **Preliminary Analyses**

Skewness and kurtosis values were checked on the variables of interest to determine the degree to which they were normally distributed. Skewness values ranged from 0.1 to 3.2, and kurtosis values ranged from 0.2 to 15.9. Square root transformations were computed for measures with high skewness or kurtosis values, and data analyses were conducted with the transformed data. However, the analyses with the transformed data, for the most part, yielded similar results as analyses with the original (untransformed) data. Therefore, to simplify descriptions and interpretations, the original data were used in the *Results* and *Discussion* sections of this report. An alternate *Results* section that includes analyses of the transformed data is in *Appendix I*.

To examine the study data in the absence of extreme values, one pair of outliers was temporarily removed, and one meaningful difference was noted. One young adult participant had reported extremely high daily calories consumed, and her/his parent had also reported extremely high daily calories consumed. Since the pair's data contained extreme outliers (for both the young adult and parent participant's daily calories consumed), this pair was temporarily excluded. The difference in results when this outlier pair was excluded will be noted as appropriate.

Tests were conducted to examine the feasibility of energy consumption, energy expenditure, and physical activity enjoyment collectively as a dietary and physical activity

score (DPA score) for young adult and parent participants. However, Cronbach's Alpha indicated that the three measures had very low internal consistency for both young adult (Cronbach's Alpha = .09) and parent (Cronbach's Alpha = -.01) measures. For both young adult and parent participant data, the internal consistency would have improved if the physical activity enjoyment measure would have been excluded. However, the improved internal consistency would have continued to be low for both young adult (Cronbach's Alpha = .12) and parent (Cronbach's Alpha = -.02) dietary and physical activity measures.

Bivariate Pearson correlations of the three measures were further examined and revealed that the young adult participants' daily calories consumed and levels of physical activity enjoyment were significantly and positively correlated with their weekly energy expenditure,  $p = .05$ ; however, the correlations were generally weak ( $r = .17$  for calories consumed and  $r = .20$  for physical activity enjoyment). Young adult participants' daily calories consumed and levels of physical activity enjoyment were not significantly correlated. For parent participants, only levels of physical activity enjoyment and weekly energy expenditure were significantly correlated,  $r = .18, p = .05$ .

To remove the potential influence of gender, the data were split between genders for both young adult and parent participants. For female young adult participants, the strength of the correlation of levels of physical activity enjoyment and weekly energy expenditure increased,  $r = .32, p = .01$ ; however the other measures were not significantly correlated. None of the measures were significantly correlated for young adult males. For female parent participants, the strength of the correlation of levels of physical activity enjoyment and weekly energy expenditure remained the same,  $r = .18, p = .05$ ; however,

no other measures were significantly correlated, and none of the measures were significantly correlated for the male parents.

After splitting the data between young adult genders, internal consistency of young adults' average daily calories consumed, weekly energy expended, and levels of physical activity enjoyment remained low (Cronbach's Alpha = .04 for females; Cronbach's Alpha = .06 for males). Similarly, after splitting the data between parent genders, internal consistency of parents' three measures continued to be low (Cronbach's Alpha = -.03 for females; Cronbach's Alpha = .35 for males). Because of the lack of internal consistency among daily calories consumed, weekly energy expended, and levels of physical activity enjoyment, a composite DPA variable combining these measures was not computed. Instead, for the remaining analyses, energy consumption, energy expenditure and physical activity enjoyment measures were analyzed separately to compare young adults' and their parents' dietary and physical activity characteristics.

### **Hypothesis #1**

Upon examination of young adult and parent participants' weight statuses, parent participants, on average, had significantly higher BMI scores ( $M = 27.6$ ,  $SD = 6.2$ ) than young adult participants ( $M = 23.3$ ,  $SD = 3.9$ ),  $t(150) = -8.4$ ,  $p < .001$ . Also, young adult participants, on average, consumed significantly greater amounts of calories per day ( $M = 1731.4$ ,  $SD = 855.2$ ) than parent participants ( $M = 1427.5$ ,  $SD = 754.7$ ),  $t(136) = 4.2$ ,  $p < .001$ . Young adult participants expended significantly more energy per week ( $M = 5144.9$ ,  $SD = 4682.6$ ) than parent participants ( $M = 2663.5$ ,  $SD = 3492.4$ ),  $t(146) = 5.2$ ,  $p < .001$ , and young adult participants, on average, agreed with the statement, "I exercise for fun" ( $M = 2.1$ ,  $SD = 0.7$ ) significantly more than parent participants ( $M = 1.7$ ,  $SD = 0.6$ ),  $t(150) =$



5.8,  $p < .001$ . BMIs, amounts of daily calories consumed, amounts of weekly energy expended and levels of physical activity enjoyment were all significantly different between young adult and parent participants.

### **Hypothesis #2**

Pearson correlation analyses were performed and revealed that young adult and parent participants' BMI scores were moderately correlated,  $r = .30$ ,  $p < .001$ . In addition, young adult and parent participants' amounts of calories consumed per day had a moderate to strong correlation,  $r = .45$ ,  $p < .001$ . Surprisingly, the removal of one pair of extreme values resulted in a non-significant correlation of young adults' and parents' daily calories consumed,  $r = .11$ ,  $p = .206$ . Weekly energy expenditure for young adult and parent participants were not correlated,  $r = .04$ ,  $p = .655$ , and levels of physical activity enjoyment between the young adult and parent participants were not correlated,  $r = .06$ ,  $p = .492$ .

### **Research Question #1**

**BMI scores and parental authority scales.** The linear combination of parents' BMI scores and the parental authority scales significantly predicted young adults' BMI scores,  $R^2 = .11$ , adjusted  $R^2 = .08$ ,  $F(4, 143) = 4.19$ ,  $p = .003$  (see Table 7). Parents' BMIs was a significant predictor while the parental authority scales were not significant. When inserted into the regression analysis, interaction terms for parents' BMIs and the parental authority scales significantly contributed to the overall model,  $R^2 = .16$ , adjusted  $R^2 = .12$ ,  $F(7, 140) = 3.92$ ,  $p = .001$  (see Table 8). Both the Authoritarian and Permissive parenting styles emerged as significant moderators of the relationship of parents' and young adults' BMIs. The interaction variable for the Authoritative measure was not significant.

Table 7

*Main Effects of Parents' BMI and PAQ Measures on Young Adults' BMI*

Variable	$\beta$	SE	<i>t</i>	<i>p</i>
Parents' BMI	0.2	0.1	3.8	< .001
Authoritative parenting score	0.5	0.6	0.8	.438
Authoritarian parenting score	0.9	0.6	1.6	.119
Permissive parenting score	0.3	0.6	0.5	.604

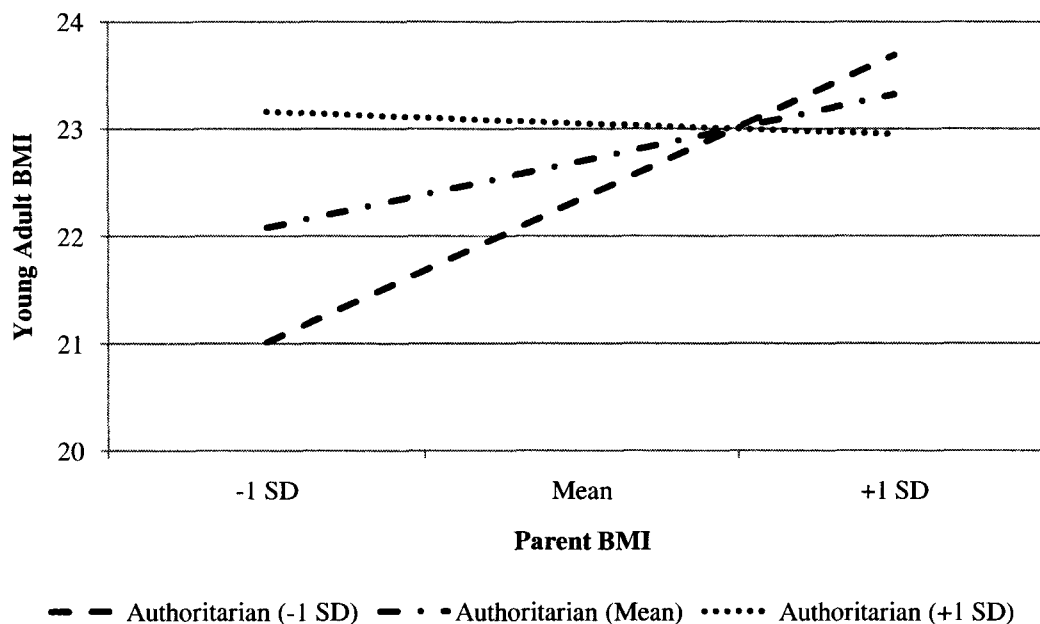
Table 8

*Interaction Effects of Parents' BMI and PAQ Measures on Young Adults' BMI*

Variable	$\beta$	SE	<i>t</i>	<i>p</i>
Parents' BMI	0.1	0.1	2.3	.025
Authoritative parenting score	0.6	0.6	0.9	.353
Authoritarian parenting score	0.9	0.6	1.5	.129
Permissive parenting score	0.3	0.6	0.5	.624
Parents' BMI * Authoritative	-0.1	0.1	-1.5	.145
Parents' BMI * Authoritarian	-0.2	0.1	-2.5	.012
Parents' BMI * Permissive	-0.3	0.1	-2.6	.010

The way in which authoritarian parenting moderated the relationship between parents' BMIs and their young adult children's BMIs is represented in Figure 3. For young adults of parents who exhibited low or moderate levels of authoritarian parenting, their

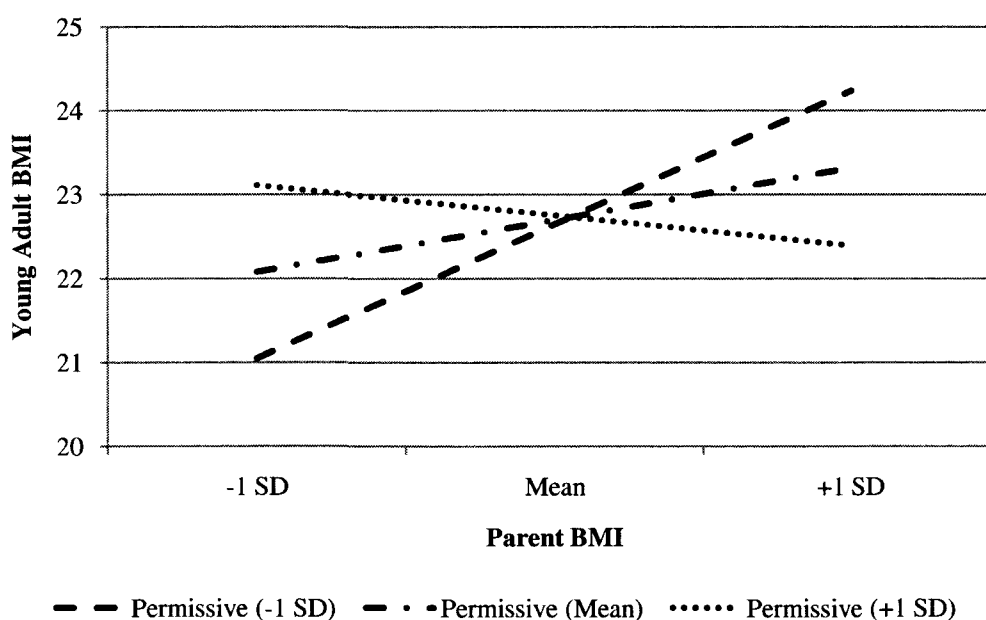
parents' BMIs positively predicted their own BMIs. However, for young adults whose parents exhibited high levels of authoritarian parenting, their parents' BMIs were inversely related to their own BMIs.



*Figure 3.* Predicted values of young adults' BMIs at mean and +/- 1 SD of parents' BMIs and Authoritarian parenting scores. Other parenting styles in the model were evaluated at their means.

The way in which permissive parenting moderated the relationship between parents' BMIs and their young adult children's BMIs was similar to the moderating relationship of authoritarian parenting and is represented in Figure 4. For young adults of parents who exhibited low or moderate levels of permissive parenting, their parents' BMIs positively predicted their own BMIs. However, for young adults whose parents exhibited high levels of permissive parenting, their parents' BMIs were inversely related to their own BMIs.

**Daily energy consumption and parental authority scales.** The linear combination of parents' daily energy consumption and the parental authority scales significantly predicted young adults' daily energy consumption,  $R^2 = .24$ , adjusted  $R^2 = .22$ ,  $F(4, 130) = 10.40$ ,  $p < .001$  (see Table 9). Parents' daily energy consumption was a significant predictor, while the parental authority scales were not significant. When inserted into the regression analysis, interaction terms for the parents' daily energy consumption measure and the parental authority scales significantly contributed to the overall model,  $R^2 = .40$ , adjusted  $R^2 = .37$ ,  $F(7, 127) = 12.11$ ,  $p < .001$  (see Table 10). The Authoritarian parenting style emerged as a significant moderator of the relationship of parents' and young adults' daily energy consumption. Interaction variables for all other parental authority scales were not significant.



*Figure 4.* Predicted values of young adults' BMIs at mean and +/- 1 SD of parents' BMIs and Permissive parenting scores. Other parenting styles in the model were evaluated at their means.

Table 9

*Main Effects of Parents' Daily Calories Consumed and PAQ Measures on Young Adults' Daily Calories Consumed*

Variable	$\beta$	SE	t	p
Parents' calories consumed per day	0.5	0.1	6.0	< .001
Authoritative parenting score	244.6	133.9	1.8	.070
Authoritarian parenting score	116.4	124.6	0.9	.352
Permissive parenting score	197.1	136.8	1.4	.152

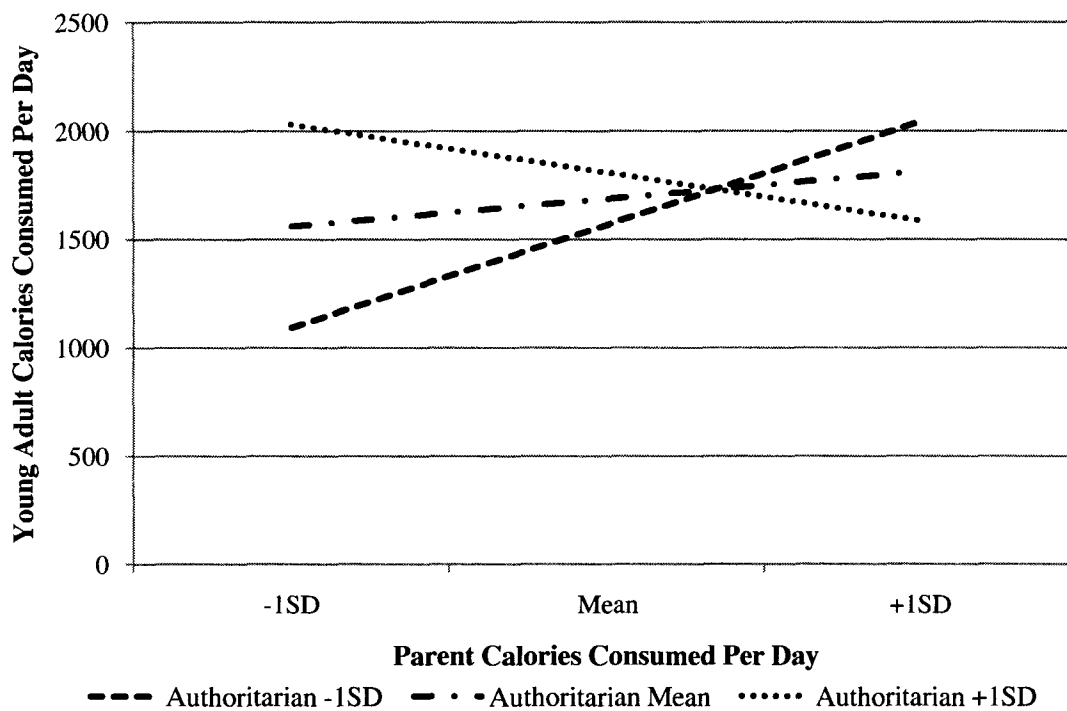
Table 10

*Interaction Effect of Parents' Daily Calories Consumed and PAQ Measures on Young Adults' Daily Calories Consumed*

Variable	$\beta$	SE	t	p
Parents' calories consumed per day	0.2	0.1	1.5	.147
Authoritative parenting score	216.1	120.7	1.8	.076
Authoritarian parenting score	205.6	113.6	1.8	.073
Permissive parenting score	189.6	123.3	1.5	.126
Parents' calories * Authoritative	-0.3	0.2	-1.3	.183
Parents' calories * Authoritarian	-0.8	0.2	-4.8	< .001
Parents' calories * Permissive	-0.2	0.2	-0.9	.370

The way in which authoritarian parenting moderated the relationship between parents' daily calorie consumption and their young adult children's daily calorie

consumption is represented in Figure 5. For young adults of parents who exhibited low or moderate levels of authoritarian parenting, their parents' average daily calorie consumption positively predicted their own average daily calorie consumption. However, for young adults whose parents exhibited high levels of authoritarian parenting, their parents' average daily calorie consumption was inversely related to their own average daily calorie consumption.



*Figure 5.* Predicted values of young adults' daily calories consumed at mean and  $\pm 1 SD$  of parents' daily calories consumed and Authoritarian parenting scores. Other parenting styles in the model were evaluated at their means.

When the one pair of extreme values was removed, the parents' daily calories consumed main effect variable became non-significant in regression analyses; however, the

interaction variable of parents' daily calories consumed and Authoritarian parenting remained significant,  $p = .003$ .

**Weekly energy expenditure and physical activity enjoyment.** The relationships of parents' and young adults' weekly energy expenditure and levels of physical activity enjoyment were examined along with the moderating relationships of parental authority scales. Parents' weekly energy expenditure was not a significant predictor of young adults' weekly energy expenditure,  $p = .596$ , and parental authority scales did not significantly contribute to the relationship ( $p = .767$  for Authoritative;  $p = .914$  for Authoritarian;  $p = .727$  for Permissive). Similarly, parents' levels of physical activity enjoyment did not significantly predict young adults' levels of physical activity enjoyment,  $p = .487$ , and parental authority scales did not significantly contribute to the relationship ( $p = .152$  for Authoritative;  $p = .558$  for Authoritarian;  $p = .820$  for Permissive).

**Family communication environment scales.** The relationships of parents' and young adults' BMIs, daily energy consumption, weekly energy expenditure and levels of physical activity enjoyment were examined along with the moderating relationships of family communication environment scales. In each model, there were no significant main effects or interaction effects involving the family communication environment variables ( $p$ -values ranged from .090 to .898 for main effect variables;  $p$ -values ranged from .251 to .938 for interaction variables).

## **Research Question #2**

Young adults' and parents' BMI scores, daily energy consumption, weekly energy expenditure, physical activity enjoyment, parental authority scales and family communication environment scales were considered along with young adults' genders and

ages and parents' genders, ages, education levels, and household income levels.

Independent samples t-tests indicated significant differences between young adult males' and females' BMI scores,  $t(148) = -2.6, p = .009$ , daily energy consumption  $t(140) = -4.0, p < .001$ , and weekly energy expenditure,  $t(146) = -2.9, p = .004$ , indicating that the young adult male participants had higher BMIs, consumed more calories per day, and expended more energy per week than the young adult females. Within each gender of young adults, correlations of young adult and parent participants' amounts of calories consumed per day were strengthened (Females:  $r = .51, p < .001$ ; Males:  $r = .49, p < .001$ ), compared to the overall correlation,  $r = .45, p < .001$ .

Within each gender of young adults, correlations of levels of physical activity enjoyment for young adults and parents, parental authority scales, and communication environment scales were not different from the overall correlations. Correlations among young adults' and parents' BMIs, daily energy consumption, weekly energy expenditure, physical activity enjoyment, parental authority scales, and family communication environment scales were not different from the overall correlations within the levels of young adults' ages and parents' genders, ages, education levels, and household income levels. Therefore, young adults' ages and parents' genders, ages, education levels, and household income levels were not considered in further analyses.

Regression analyses were conducted to consider the influence of gender of young adult participants. First, a separate regression analysis was conducted and included young adults' daily energy consumption as the dependent variable and young adult gender, parent daily energy consumption, and the interaction between them (i.e. their product). The regression model for the main effects was significant,  $R^2 = .32$ , adjusted  $R^2 = .31, F(2, 133)$



= 31.56,  $p < .001$ ; however the interaction term did not contribute to the overall model and was not significant,  $p = .84$ .

Also, a separate regression analysis was conducted and included young adults' BMI as the dependent variable and young adult gender, parent BMI, and the interaction between them. The regression model for the main effects was significant,  $R^2 = .15$ , adjusted  $R^2 = .14$ ,  $F(2, 147) = 12.74$ ,  $p < .001$ ; however the interaction term was not significant,  $p = .13$ .

**BMI scores and parental authority scales, controlling for gender.** The young adult gender variable was included in the regression analysis of the predictive relationships of parents' BMI scores and parental authority scales on young adults' BMI scores. The linear combination of young adults' gender variable along with parents' BMI score and the parental authority scales significantly predicted young adults' BMI,  $R^2 = .15$ , adjusted  $R^2 = .12$ ,  $F(5, 141) = 4.88$ ,  $p < .001$  (see Table 11). Terms for the interactions between parents' BMI score and the parental authority scales significantly contributed to the model,  $R^2 = .20$ , adjusted  $R^2 = .15$ ,  $F(8, 138) = 4.33$ ,  $p < .001$  (see Table 12). Significant predictors of young adults' BMIs were young adult gender (male), parents' BMIs, the interaction of parents' BMI score and the Authoritarian measure and the interaction of parents' BMI score and the Permissive measure. Both authoritarian and permissive parenting styles moderated the predictive relationship of parents' BMI and young adults' BMI.

The moderating effects of the parenting styles on the relationship between parents' BMIs and young adults' BMIs were not affected by gender. Rather, gender was simply a main effect, indicating that males have overall higher BMIs than females. This interaction is represented previously in Figures 3 and 4.

Table 11

*Main Effects of Young Adults' Gender, Parents' BMI, and PAQ Measures on Young Adults' BMI*

Variable	$\beta$	SE	<i>t</i>	<i>p</i>
Young adult gender (male)	1.7	0.6	2.6	.009
Parents' BMI	0.2	0.0	4.1	< .001
Authoritative parenting score	0.5	0.6	0.8	.400
Authoritarian parenting score	0.6	0.6	1.0	.296
Permissive parenting score	0.1	0.6	0.2	.872

Table 12

*Interaction Effects of Young Adults' Gender, Parents' BMI, and PAQ Measures on Young Adults' BMI*

Variable	$\beta$	SE	<i>t</i>	<i>p</i>
Young adult gender (male)	1.6	0.6	2.5	.014
Parents' BMI	0.1	0.1	2.6	.011
Authoritative parenting score	0.6	0.6	1.0	.338
Authoritarian parenting score	0.6	0.6	1.0	.302
Permissive parenting score	0.1	0.6	0.2	.864
Parents' BMI * Authoritative	-0.2	0.1	-1.5	.131
Parents' BMI * Authoritarian	-0.2	0.1	-2.2	.028
Parents' BMI * Permissive	-0.3	0.1	-2.6	.010

**Daily energy consumption and parental authority scales, controlling for gender.** Young adult gender was included in the regression analysis of the predictive relationships of parents' average daily energy consumption and parental authority scales on young adults' average daily energy consumption. The linear combination of the young adults' gender variable, the parents' daily energy consumption measure and the parental authority scales significantly predicted young adults' daily energy consumption,  $R^2 = .35$ , adjusted  $R^2 = .32$ ,  $F(5, 128) = 13.64$ ,  $p < .001$  (see Table 13). Terms for the interaction between parents' daily energy consumption measure and the parental authority scales significantly contributed to the model,  $R^2 = .48$ , adjusted  $R^2 = .45$ ,  $F(8, 125) = 14.45$ ,  $p < .001$  (see Table 14). Significant predictors of young adults' average daily energy consumption included young adult gender (male), parents' average daily energy consumption, Authoritative parenting score and the interaction of parents' energy consumption and the Authoritarian parenting score.

Table 13

*Main Effects of Young Adults' Gender, Parents' Daily Calories Consumed, and PAQ Measures on Young Adults' Daily Calories Consumed*

Variable	$\beta$	SE	t	p
Young adult gender (male)	587.6	129.4	4.5	< .001
Parents' calories consumed per day	0.6	0.1	6.8	< .001
Authoritative parenting score	250.7	125.2	2.0	.047
Authoritarian parenting score	32.7	118.4	0.3	.783
Permissive parenting score	97.1	129.8	0.7	.456

Table 14

*Interaction Effects of Young Adults' Gender, Parents' Daily Calories Consumed, and PAQ Measures on Young Adults' Daily Calories Consumed*

Variable	$\beta$	SE	$t$	$p$
Young adult gender (male)	514.2	117.9	4.4	< .001
Parents' calories consumed per day	0.2	0.1	2.1	.036
Authoritative parenting score	222.0	113.3	2.0	.052
Authoritarian parenting score	125.0	108.7	1.2	.252
Permissive parenting score	102.8	117.3	0.9	.382
Parents' calories * Authoritative	-0.3	0.2	-1.4	.160
Parents' calories * Authoritarian	-0.7	0.2	-4.8	< .001
Parents' calories * Permissive	-0.2	0.2	-1.1	.256

When controlling for gender, the authoritative parenting style was directly positively related to the amounts of calories consumed per day by young adults, no matter the amounts of calories consumed per day by their parents. Interestingly, in the prior (uncontrolled) analyses, authoritative parenting was a marginally significant positive predictor of young adults' daily calories consumed (main effects model:  $p = .070$ ; interaction effects model:  $p = .076$ ). When controlling for young adult gender, authoritative parenting became significant,  $p = .047$ , but was marginally significant again when interaction terms were added to the regression model,  $p = .052$ .

The moderating relationship of the authoritarian parenting style persisted when controlling for young adult gender. As illustrated previously in Figure 5, high levels of the

authoritarian parenting style were associated with an inverse relationship of young adults' and their parents' average calories consumed per day.

**Other measures, controlling for gender.** Predictors of weekly energy expenditure and physical activity enjoyment remained non-significant when controlling for gender. Similarly, the family communication environment scales remained non-significant when the gender variable was included in the regression analyses.

## CHAPTER 7. DISCUSSION

The goal of the current study has been to examine the relationships of parents' weight statuses, daily energy consumption, weekly energy expenditure, and levels of physical activity enjoyment and their young adult children's weight statuses, daily energy consumption, weekly energy expenditure, and levels of physical activity enjoyment, respectively. Further, this study has examined the influences of parental authority and family communication environments on these relationships, and the covarying influence of specific demographic characteristics has been explored.

Current studies indicate that adolescent and young adult males typically have higher BMIs, are more likely to consume more calories or binge eat, and are more interested in physical activity behaviors than their female counterparts (Berrahmoune et al., 2008; Brunstrom, Rogers, Pothos, Calitri, & Tapper, 2008; Freedman, 2010; Hill & Cleven, 2005; Lutosławska, Malara, Mazurek, & Cszjkowska, 2007). Accordingly, in the current study, BMIs were significantly higher in male than in female young adults, and young adult males consumed more calories per day and expended more calories per week than young adult females. However, when considering levels of physical activity enjoyment, there is no significant difference between male and female young adults.

Preliminary analyses revealed that young adults' energy consumption, energy expenditure, and physical activity enjoyment variables are not sufficiently correlated to combine into a score that represents the related behaviors. This finding is contrary to the notion of the reinforcing and co-occurring nature of behaviors that is represented by social action theory (Ewart, 1991). It should be noted, however, that many of the measures are significantly correlated, although the correlations are weak. Future research should

examine the reinforcing and co-occurring nature of health-related behaviors that is represented by social action theory. It would be beneficial to include weight-related health behaviors in such analyses in addition to other health behaviors, such as substance use, health risk prevention, and injury prevention measures.

Contrary to the expectation in hypothesis #1, parents' BMIs are significantly higher than young adults' BMIs. However, consistent with hypothesis #2, the BMIs are moderately correlated. In other words, although parents' BMIs are significantly higher than young adults' BMIs, parents' BMI values consistently align with their children's BMI values.

Contrary to expectations, young adults' amounts of energy expenditure and levels of physical activity enjoyment are significantly different from and are not correlated with their parents' amounts of energy expenditure and levels of physical activity enjoyment, respectively. However, daily calories consumed have a moderate to strong correlation and are significantly different between young adults and parents. This provides evidence that, although young adults consume greater calories on average than their parents, they do so at a rate that correlates with their parents' daily calorie consumption.

When controlling for young adults' genders, parents' BMIs are predictive of their young adult children's BMIs. Also, parents' average daily calories consumed are predictive of their young adult children's average daily calories consumed. Although current studies do not examine weight statuses and dietary behaviors of young adults and their parents who no longer live in the same household, many intervention studies and reviews suggest that changes in parents' weight or weight-related health behaviors influence changes in their children's BMIs and weight-related health behaviors (Avenell &

Goode, 2008; Bautista-Castaño et al., 2004; Blom-Hoffman et al., 2008; Bowman, 2005; Caroli et al., 2004; Chen et al., 2008; Haire-Joshu et al., 2008; Hunter et al., 2008; Lansky & Vance, 1983; McCallum et al., 2007; Peterson & Fox, 2007; Philippas & Lo, 2005; Roberts, 2000; Talpade, 2008). Also, as mentioned previously, the theory of planned behavior (Ajzen, 1991), social cognitive theory (Bandura, 2004), social action theory (Ewart, 1991), and systems theory (Galvin & Brommel, 1986; Watzlawick et al., 1967) are consistent with the notion that parental weight-related behaviors help support the development of their children's weight-related behaviors.

Interestingly, neither weekly energy expenditure nor physical activity enjoyment measures of parents are predictive of their young adult children's weekly energy expenditure and physical activity enjoyment measures, respectively. This could be, at least in part, because a majority of the young adult participants (96.0%) attend a large Upper Midwestern university, and many live on campus (67.5%). The university students have access to a state-of-the-art on-campus fitness center and related fitness programming and are subject to university-sponsored advertisements that promote physical fitness and use of the fitness facility. Moreover, if some of the young adult participants were student athletes, they would engage in unusually high amounts of physical activity.

The theory of planned behavior (Ajzen, 1991), social cognitive theory (Bandura, 2004), and social action theory (Ewart, 1991) represent the influence of physical environments and social norms on behaviors. Additionally, systems theory (Galvin & Brommel, 1986; Watzlawick et al., 1967) represents the influence of norms and the interrelationship of members of a social system. Perhaps the university environment is more conducive to regular physical activity, and engaging in physical activity may be more



popular among young adult peers than parents. Future studies should further explore the lasting effects of family culture and parental standards on children's physical activity behaviors, and strategies should be examined that effectively influence young adults toward healthful physical activity behaviors, although perhaps away from parental norms.

When controlling for gender, both the authoritarian and permissive parenting styles moderate the relationship of parents' to young adults' BMIs. Also, when controlling for gender, the relationship of parents' and young adults' daily calories consumed is moderated by the authoritarian parenting style, indicating that parents' and young adults' daily calories consumed have an inverse relationship in the presence of high levels of authoritarian parenting. This provides evidence that young adults whose parents exhibited high levels of the authoritarian parenting style may rebel or act in an opposite way from their parents by consuming at different levels than them. Similarly, in the presence of high levels of permissive parenting, parents' and young adults' BMIs are inversely related, although the permissive parenting style is not a significant moderator of the relationship of parents' and young adults' daily calories consumed. This indicates that young adults whose parents exhibited high levels of the permissive parenting style may not view their parents' weight-related behaviors as examples to follow and instead engage in a combination of other weight-related behaviors that lead to opposite levels of BMIs as their parents.

Arehart-Treichel (2007) has noted that the permissive parenting style is associated with increased weight in children. Other studies have found that the authoritarian parenting style is directly related to excessive weight in children (Rhee et al., 2006) and also with disordered eating in children (Enten & Golan, 2009). Although this study does not support

the direct relationships of young adults' BMIs and eating behaviors with the permissive or authoritarian parenting styles, it does provide evidence that children of the authoritarian parenting style engage in calorie consumption behaviors that are opposing to their parents' behaviors. This finding suggests that young adult children of the authoritarian parenting style may reject the healthful dietary principles that were taught or practiced by their parents. However, this finding also suggests that these children may reject the unhealthy dietary principles that were taught or practiced by their parents. Future research should include a close examination of dietary behaviors in children and adolescents of permissive and authoritarian parents and how these individuals divert from or retain learned weight-related health behaviors during their transition to young adulthood.

In the current study, the authoritative parenting style is a predictor of young adults' calories consumed per day when controlling for gender. For every one point (on a scale of 1 to 5) that the authoritative parenting score increases, young adults' average daily energy consumption increases 222 calories, and parents' daily energy consumption has no influence on this increase. Current research indicates that, when compared with authoritarian and permissive parenting styles, the authoritative parenting style is more closely associated with increased levels of positive health behavior and decreased levels of negative health behavior during the transition from childhood to adolescence (Arredondo, Elder, Ayala, Campbell, Baquero, & Duerksen, 2006; Lohaus et al., 2009; Pearson, Atkin, Biddle, Gorely, & Edwardson, 2010). One study specifically notes that adolescents of the authoritative parenting style typically eat breakfast on more days of the week (Pearson et al.). The current study does not examine specific dietary activities of young adults. Further, it does not examine whether the calories consumed are in excess or shortage of

recommended daily calories. Therefore, the current research on the link between authoritative parenting and positive health behaviors is neither supported nor refuted; however, the current study does indicate that studies of the direct relationships of *amounts* of dietary consumption and parenting styles are warranted.

Although current literature suggests that family communication environments influence children's well-being (Baxter et al., 2005; Koerner & Fitzpatrick, 2002; Koesten et al., 2009; Schrodt et al., 2007), this study has not provided evidence that family communication environments influence the relationships of young adults' and parents' weight statuses, dietary behaviors, or levels of physical activity enjoyment. Since prior studies' evidence has been based on overall measures of children's well-being, it would be prudent to explore how communication environments relate to the many components (in addition to health-related behaviors) that contribute to overall well-being.

Other demographic variables of interest do not contribute to the relationships of the measures examined in this study. This could be because the sample is largely homogeneous. Future research would benefit from heterogeneous sampling or sampling of individuals of particular races, socioeconomic statuses or family structures. Also, a study that focuses on the relationships of the measures of interest between fathers and sons would be particularly interesting. In this study, a majority of the young adults are female, and a majority of the parents (whom the young adults consider to have been primarily responsible for their families' grocery purchases and activities) are the young adults' mothers.

There are several limitations in this study that should be addressed. First, the study aimed to recruit young adults, aged 18 to 25 years. Although the range of participants is 18

to 25 years, as was hoped, a majority of the young adult participants (87.0%) are aged 18 to 20 years. Also, a majority (60.9%) are female. Almost all (99.3%) are full-time students, 85.4% are freshmen and sophomores, and 96.0% attend NDSU. Nearly all of the young adult participants have never been married (98.7%), although 90.1% do not live with their parents. Many (67.5%) live in university or college housing, and most (81.5%) spent their childhood and adolescence living in a home with both of their biological parents. Also, both young adult and parent participants are mostly white (88.7% of young adults; 92.1% of parents). The current study, therefore, is not generalizable to the young adult population in the United States. However, it would support studies of and interventions that target weight-related health behaviors of college students, particularly white students that are early in their academic careers and live in campus housing.

Data collection consisted solely of online and paper questionnaires, and the related limitations do exist in this study. For example, although current literature provides evidence that the questionnaires are valid and reliable, each questionnaire does contain a level of error when compared to longer questionnaires or behavior diary assessments. The questionnaire data are also subject to self-report bias and inadvertent errors.

The current study sample of young adults and parents had self-selected to participate, and therefore, a self-selection bias could have occurred. Wu and Weaver (1997) recommend exercising caution when interpreting questionnaire data from a self-selected sample, as participants who self-select to participate in a questionnaire study typically have strong personal opinions about the study topic and could, therefore, make up a non-representative and biased sample. Participants in this study tended to be more of normal weight status and less of overweight or obese status when compared to national

norms, evidencing the possibility that the study participants are interested in weight-related health behaviors and could be more likely to maintain normal weight statuses than the general national population.

It has been noted that many of the young adult participants and parent participants who ended their participation prior to completing the FFQ are Asian (57.1% and 42.9%, respectively). Also 12.5% of the young adult participants whose parents did not participate at all and 11.1% of the parent participants whose young adult children did not participate are Asian. A language barrier or cultural barrier could have been created by the questionnaires used in this study. In addition, since a majority of the young adult participants are full-time college students, it is possible that some parents of those who are Asian continue to live in their home country and had difficulty accessing the study.

Lastly, the data in this study included outliers for the young adult and parent participants' BMI scores, daily calories consumed and weekly energy expended measures; however, justification for excluding the outliers from the analyses simply did not exist. For example, young adult participants who indicated extremely high amounts of average daily energy consumption also indicated high amounts of average weekly energy expenditure. Correspondingly, the parents of the young adult participants with high values also reported high values on many of the same variables. Therefore, it should be noted that the analyses performed in this study that are related to young adults' and parents' daily calories consumed are in the presence of outliers that skew the data toward significant findings. No other meaningful differences in results were noted upon the removal of outliers.

In conclusion, the current study has provided an examination of theoretical frameworks, a review of interventions, and empirical evidence to suggest that some

parental behaviors influence children's weight-related behaviors. The theory of planned behavior (Ajzen, 1991), social cognitive theory (Bandura, 2004), social action theory (Ewart, 1991), and systems theory (Watzlawick et al., 1967) portray relationships between influential factors and individual behavior patterns. Key influential factors that are emphasized in the theory of planned behavior, social cognitive theory, and social action theory represent, in large part, individual perceptions and learned norms. Systems theory applies the influence of family or group norms to individual behaviors even more directly. The empirical evidence in the current study does not demonstrate the direct relationships between perceptions, norms, and behaviors. Rather, the evidence demonstrates relationships between parent and child behaviors. The behavioral relationships, however, help shine light on the possible influences on perceptions and the possible effects of norms. Individual perceptions and group norms, according to the theories of interest in this study, directly influence behavior patterns.

Specifically, evidence in the current study has demonstrated that dietary behaviors of parents help predict dietary behaviors of their young adult children, suggesting that parents' dietary activities are models of behavior from which children learn. In addition to parents' dietary activities, the current study also provides evidence that former parental authority interacts with the predictive relationship of parents' and their young adult children's dietary behaviors, suggesting that parental authority plays a role in the development of young adults' perceptions about learned behaviors, learned norms, and the importance of complying with norms. Taken together, parental dietary behavior and parental authority influence young adults' perceptions, and those perceptions directly influence young adults' dietary behaviors. The empirical evidence in the current study

does not, however, demonstrate relationships of parents' and young adults' behaviors related to physical activity.

The four theories described in this study also portray influences on behaviors that are more tangible in nature. For example, accessibility and ability to perform a behavior largely determine whether an individual will engage in the behavior. Some studies included in the *Review of Interventions* suggest that encouraging parents to modify potential barriers and facilitators of children's weight-related behaviors (i.e. grocery purchases and planned activities) have led to improvements in children's behaviors. In the current study, such barriers and facilitators were not examined, and to avoid recruiting participants whose parents could impose barriers or facilitators, recruitment efforts directly targeted young adults. A key barrier or facilitator that is depicted in the theories of interest, although not tangible, is self-efficacy. Self-efficacy was not measured in this study, however it is possible that, by means of modeling behaviors and parental authority, levels of young adults' self-efficacy could be influenced by parents and could therefore be an additional influence on young adults' behaviors.

The findings in the current study have helped reveal potential influences on key factors that influence weight-related behaviors, and implications for treatment and prevention of weight-related health behaviors have emerged. In professional practice, the types of parental authority to which clients have been subjected should be of interest to counselors when bodyweight or dietary behaviors are of primary concern. Although treatment for such clients may be oriented to behavior change, a reflection on past influences may aid the progression toward more healthful and desirable behaviors.

This study also supports the need for heightened parental education and programs to encourage authoritative parenting and discourage authoritarian and permissive parenting styles. Even more, weight-related health interventions that aim to benefit children by including parents should aim to increase awareness of parental authority and should encourage healthful parenting practices.

Future research efforts should continue the study of weight-related health behavior development and aim to broaden the study of the influence of parental authority. For example, behavior similarities and differences among siblings of the same household should be of interest. Research that examines barriers and facilitators to young children's weight-related behaviors that are imposed by parents would also be valuable. Further, a longitudinal examination of the lasting influence of the imposed barriers and facilitators would be particularly worthwhile. A detailed study of the influence of parental authority on dietary behaviors among various cultures would also be beneficial.

In addition, systematic and detailed reviews of weight-related health interventions are needed. Noting specific trends of interventions that target children and adolescents while including parents would be beneficial. Further, exploring trends of interventions that target parents as the primary participators and children as the primary recipients of intervention activities would be especially noteworthy in the study of parental influences on children's development of weight-related health behaviors. An examination of longitudinal studies should also be of interest to determine the lasting effects of both parental influences and intervention activities.

Lastly, research on the contribution of family communication environments should continue. Perhaps examining relationships of family communication environments and



young adults' perceptions about weight-related health behaviors would be of value. Further, a deeper exploration of "well-being" and its relationships to family communication environments would be beneficial.

A key strength of this study is in its methodology. Obtaining direct self-reported information from each parent and child participant made it more likely that the data collected would reflect actual behavior rather than an informant's perception of behavior. Although there is value in obtaining data about both parent and child participants singly from either the parent or the child, collecting information directly from each study participant more accurately portrays individual behaviors. More comparison studies that measure actual weight-related health behaviors are needed.

The prevalence of overweight conditions among the U.S. population is a national concern (USDHHS, 2000, 2011) and for good reason. The related monetary, societal, and personal costs are likely innumerable, as described in the *Introduction*. The current study has provided evidence that indicates weight statuses, dietary behaviors, and parenting styles of parents are related to the weight statuses and dietary behaviors of their young adult children. These findings open pathways for novel exploration. Current research has illustrated that many factors influence the development and continual adjustment of individuals' weight statuses and weight-related health behaviors. This study, however, confirms that continued research of parental behaviors could be key to understanding fundamental influences on the development of weight-related health behaviors and to identifying critical components of successful intervention activities.

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\*Included in *Review of Interventions*.

## APPENDIX A. REVIEW OF INTERVENTIONS

Table A1

*Review of Childhood and Adolescence Overweight and Obesity Interventions*

Study	Intervention Characteristics						Post-assessment Outcomes							
	Length	NE	PE	PS	BL	PP	IK	ID	P A	IS	BM*	WC	RW	OI
Chang et al., 2007 (1)	9 mo.	X		X						X	X			
Chang et al., 2007 (2)	9 mo.	X												
Edwards et al., 2006	19 mo.	X	X		X	X					X			
Graf et al., 2005**	9 mo.	X		X		X								X
Hunter et al., 2008	10 wk.	X	X		X	X	X				X			
Jiang et al., 2007**	3 yr.	X		X		X					X		X	
Kain et al., 2004**	6 mo.	X		X		X								X
Kaufman et al., 2008	5 mo.	X						X			X		X	X
Lazaar et al., 2007**	6 mo.			X								X		X
Muth, et al., 2008**	12 wk.	X	X					X						

Table A1 (continued)

Study	Intervention Characteristics						Post-assessment Outcomes							
	Length	NE	PE	PS	BL	PP	IK	ID	PA	IS	BM*	WC	RW	OI
Nemet et al., 2005**	3 mo.	X		X		X			X		X		X	
Sacher et al., 2005	3 mo.	X		X	X	X					X	X		X
Salmon et al., 2008 (1)**	8 mo.				X				X					
Salmon et al., 2008 (2)**	8 mo.			X					X					
Salmon et al., 2008 (3)**	8 mo.			X	X				X		X			
Speroni et al., 2008	24 wk.	X	X	X							X	X		
Vizcaíno et al., 2008**	9 mo.			X										X
Weigel et al., 2008**	1 yr.	X		X	X	X					X			X
Yin et al., 2005**	3 mo.	X	X				X	X	X		X			X

Note: Studies by Chang, et al. and Salmon, et al. reported multiple interventions which are listed separately. Length = Intervention Length; NE = Nutrition Education; PE = Physical Activity Education; PS = Physical Activity Sessions; BL = Behavior Lessons/Sessions; PP = Parent(s) Participated; IK = Increased Knowledge; ID = Improved Dietary Habits (i.e. reduced consumption

Table A1 (continued)

of high-fat or high-sugar foods and increased consumption of nutrient dense, low-fat, or low-sugar foods); PA = Increased Physical Activity; IS = Improved Physical Activity Skills; BM = Reduced BMI, relative to normal maturation and among all intervention participant groups; WC = Decreased Waist Circumference; RW = Reduced Weight; OI = Other Related Improvements.

\* BMI is the only measurement that was consistently recorded among all included intervention studies. \*\* Controlled study.



**APPENDIX B. CONSENT LETTERS****NDSU****North Dakota State University**

Department of Human Development and Family Science  
EML Hall, 283  
Dept. 2615; P.O. Box 6050  
Fargo, ND 58108-6050  
701-231-8268

**Title of Research Study: Weight-related health behaviors of young adults and their parents**

Dear Young Adult:

This study is being conducted in order to help describe and understand the development of individuals' dietary and physical activity behaviors. It is our hope that, with this research, we will learn more about how parents' behaviors influence the dietary and physical activity behaviors of their children. Findings from this study could be used to help improve or create programs that aim to encourage families to achieve and/or maintain healthful diets and physical activity levels.

You are invited to take part in this research project because you are 18 to 25 years old and you have a parent that is also willing to participate in this project. Your participation is entirely your choice, and you may change your mind or quit participating at any time, with no penalty to you.

It is not possible to identify all potential risks in research procedures, but I, along with all of the researchers who are participating in this project, have taken reasonable safeguards to minimize any known risks. The known risk in this project includes loss of confidentiality. While completing the study questionnaires, you will be asked to provide your name, your parent's name, and your email address. Your personal information will be kept strictly confidential, and it will only be available for the researchers in this study. After you have completed the questionnaires, and after we identify your parent's questionnaires, we will delete your name, your parent's name, and your email address from our records. Since the majority of this study is being conducted electronically, it is possible that the security of the electronic records could be breached. However, we feel that such a breach in confidentiality is highly unlikely, and we will do everything possible to assure that your personal information is held in strict confidentiality at all times.

After completing your questionnaires, you will receive a personalized dietary profile based on your responses to the diet questionnaire. Your dietary profile will include

a summary of characteristics about your diet, and it will provide suggestions to help you improve your diet, if you wish.

It should take about 1 hour for you to complete the questions about your demographics information, your physical activity levels, your diet, your parent's style of parenting, and your communication environment. We will keep private all research records that identify you, to the extent allowed by law. Your information will be combined with information from other people taking part in the study, and we will write about the combined information that we have gathered. You will not be identified in these written materials. We may publish the results of the study; however, we will keep your name and other identifying information private.

If you have any questions about this project, please contact us. You have rights as a research participant. If you have questions about your rights or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program at 701.231.8908, [ndsu.irb@ndsu.edu](mailto:ndsu.irb@ndsu.edu), or by mail at: NDSU HRPP Office, NDSU Dept 4000, PO Box 6050, Fargo, ND 58108-6050.

Thank you for taking part in this research. If you wish to receive a copy of the results, please contact us.

Sincerely,

**Brandi Niemeier**  
[brandi.niemeier@ndsu.edu](mailto:brandi.niemeier@ndsu.edu)  
701-367-8317

**Joel Hektner**  
[joel.hektner@ndsu.edu](mailto:joel.hektner@ndsu.edu)  
701-231-8269

**NDSU****North Dakota State University**

Department of Human Development and Family Science  
EML Hall, 283  
Dept. 2615; P.O. Box 6050  
Fargo, ND 58108-6050  
701-231-8268

**Title of Research Study: Weight-related health behaviors of young adults and their parents**

Dear Parent:

This study is being conducted in order to help describe and understand the development of individuals' dietary and physical activity behaviors. It is our hope that, with this research, we will learn more about how parents' behaviors influence the dietary and physical activity behaviors of their children. Findings from this study could be used to help improve or create programs that aim to encourage families to achieve and/or maintain healthful diets and physical activity levels.

You are invited to take part in this research project because you are a parent of a young adult who is 18 to 25 years old who is also willing to participate in this project. Your participation is entirely your choice, and you may change your mind or quit participating at any time, with no penalty to you.

It is not possible to identify all potential risks in research procedures, but all of the researchers who are participating in this project have taken reasonable safeguards to minimize any known risks. The known risk in this project includes loss of confidentiality. While completing the study questionnaires, you will be asked to provide your name, your child's name, and your email address. Your personal information will be kept strictly confidential, and it will only be available for the researchers in this study. After you have completed the questionnaires, and after we identify your child's questionnaires, we will delete your name, your child's name, and your email address from our records. Since the majority of this study is being conducted electronically, it is possible that the security of the electronic records could be breached. However, we feel that such a breach in confidentiality is highly unlikely, and we will do everything possible to assure that your personal information is held in strict confidentiality at all times.

After completing your questionnaires, you will receive a personalized dietary profile based on your responses to the diet questionnaire. Your dietary profile will include a summary of characteristics about your diet, and it will provide suggestions to help you improve your diet, if you wish.

It should take about 35 minutes for you to complete the questions about your demographics information, physical activity levels, and your diet. We will keep private all research records that identify you, to the extent allowed by law. Your information will be combined with information from other people taking part in the study, and we will write about the combined information that we have gathered. You will not be identified in these written materials. We may publish the results of the study; however, we will keep your name and other identifying information private.

If you have any questions about this project, please contact us. You have rights as a research participant. If you have questions about your rights or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program at 701.231.8908, [ndsu.irb@ndsu.edu](mailto:ndsu.irb@ndsu.edu), or by mail at: NDSU HRPP Office, NDSU Dept 4000, PO Box 6050, Fargo, ND 58108-6050.

Thank you for taking part in this research. If you wish to receive a copy of the results, please contact us.

Sincerely,

Brandi Niemeier  
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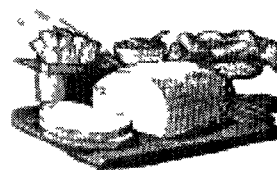
**APPENDIX C. BLOCK BRIEF FOOD FREQUENCY QUESTIONNAIRE**

**RESPONDENT ID NUMBER**


**TODAY'S DATE**

<input type="radio"/> Jan	DAY	YEAR
<input type="radio"/> Feb		
<input type="radio"/> Mar		2000
<input type="radio"/> Apr		2001
<input type="radio"/> May		2002
<input type="radio"/> Jun		2003
<input type="radio"/> Jul		2004
<input type="radio"/> Aug		2005
<input type="radio"/> Sep		2006
<input type="radio"/> Oct		2007
<input type="radio"/> Nov		2008
<input type="radio"/> Dec		2009

**BRIEF FOOD QUESTIONNAIRE**



- This form is about the foods you usually eat. It will take about 15 - 25 minutes to complete.
- Please answer each question as best you can. Estimate if you aren't sure.
  - Use only a No. 2 pencil.
  - Fill in the circles completely, and erase completely if you make any changes.

Please print your name in this box.

**SEX**  
 Male  
 Female

If female, are you pregnant or breast feeding?

No  
 Yes  
 Not female

AGE	WEIGHT pounds	HEIGHT in.

This form is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. There are two kinds of questions for each food.

**HOW OFTEN**, on average, did you eat the food during the past year?  
 \*Please DO NOT SKIP any foods. Mark "never" if you didn't eat it.

**HOW MUCH** did you usually eat of the food?  
 \*Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.  
 \*Sometimes we ask "how much" as A, B, C or D. LOOK AT THE ENCLOSED PICTURES. For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat. (If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D= 2 cups.)

**EXAMPLE:** This person drank apple juice twice a week, and had one glass each time. Once a week he ate a "C" sized serving of rice (about 1 cup).

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR								HOW MUCH EACH TIME				
	NEVER	A FEW TIMES		ONCE		TWICE		EVERY DAY	SEE PORTION SIZE PICTURES FOR A-B-C-D				
		YEAR	MONTH	MONTH	WEEK	WEEK	WEEK		WEEK	How many glasses each time	How much each time		
Apple juice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	A	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

PLEASE DO NOT WRITE IN THIS AREA  
 ○○○

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR						HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D
	A FEW TIMES PER YEAR	1-2 ONCE PER MONTH	3-4 TIMES PER WEEK	5-6 TIMES PER WEEK	7-8 TIMES PER WEEK	EVENT DAY	

Eggs, including egg biscuits or Egg McMuffins (Not egg substitutes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices each time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bacon or breakfast sausage, including sausage biscuit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many pieces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cooked cereals like oatmeal, cream of wheat or grits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many cups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cold cereals like Corn Flakes, Cheerios, Special K, fiber cereals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many cups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Which cereal do you eat most often? **MARK ONLY ONE:** Bran Buds, Raisin Bran, Fruit-&-Fiber, other fiber cereals  
 Product 19, Just Right, Total  Other cold cereal, like Corn Flakes, Cheerios, Special K

Cheese, sliced cheese or cheese spread, (including on sandwiches, yogurt (not frozen yogurt))	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How often do you eat each of the following fruits?												

Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Apples or pears	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oranges, tangerines, not including juices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Applesauce, fruit cocktail, or any canned fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Any other fruit, like grapes, melon, strawberries, peaches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR						HOW MUCH EACH TIME			
	A FEW TIMES PER YEAR	ONCE PER MONTH	2-3 TIMES PER MONTH	1-4 TIMES PER WEEK	5-6 TIMES PER WEEK	7-8 TIMES PER WEEK	SEE PORTION SIZE PICTURES FOR A-B-C-D	A	B	C

How often do you eat each of the following vegetables, including fresh, frozen, canned or in stir fry, at home or in a restaurant?

French fries, fried potatoes or hash browns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
White potatoes not fried, incl. boiled, baked, mashed & potato salad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sweet potatoes, yams, or sweet potato pie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rice, or dishes made with rice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Baked beans, chili with beans, pinto, any other dried beans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Refried beans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Green beans or green peas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Broccoli	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carrots, or stems or mixed vegetables containing carrots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spinach, or greens like collards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cole slaw, cabbage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Green salad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Raw tomatoes, including in salad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catsup, salsa or chile peppers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Salad dressing or mayonnaise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many TSP?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
(Not below)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many TSP?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Any other vegetable, like corn, squash, okra, cooked green peppers, cooked onions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetable soup, vegetable beef, chicken vegetable, or tomato soup	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Which bowl	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

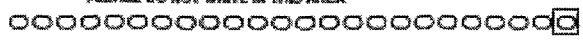
11/11/2011 11:11 AM







PLEASE DO NOT WRITE IN THIS AREA



TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR								HOW MUCH EACH TIME					
	NEVER	A FEW TIMES		ONCE		TWICE		3-4 TIMES		SEE PORTION SIZE PICTURES FOR A-B-C-D				
		YEAR	MONTH	MONTH	WEEK	WEEK	WEEK	WEEK	WEEK	WEEK	EVERY DAY	A	B	C
<b>Pasta, breads, spreads, snacks</b>														
Spaghetti, lasagna, or other pasta with tomato sauce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cheese dishes without tomato sauce, like macaroni and cheese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pizza, including carry-out	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Biscuits, muffins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many each time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rolls, hamburger buns, English muffins, bagels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many each time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
White bread or toast, including French, Italian, or in sandwiches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dark bread like rye or whole wheat, including in sandwiches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many slices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tortillas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many each time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Margarine on bread, potatoes or vegetables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many pats (Tsp.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Butter on bread, potatoes or vegetables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many pats (Tsp.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peanuts or peanut butter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many Tbsp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snacks like potato chips, corn chips, popcorn (Not pretzels)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Doughnuts, cake, pastry, pie	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many pieces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cookies (Not lowfat)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice cream, frozen yogurt, ice cream bars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When you eat ice cream or frozen yogurt, is it	<input type="checkbox"/> Usually low-fat <input type="checkbox"/> Sometimes <input type="checkbox"/> Rarely low-fat <input type="checkbox"/> N/A													
Chocolate candy, candy bars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many bars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

TYPE OF BEVERAGE	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D			
	A FEW TIMES PER YEAR	ONCE PER MONTH	2-3 TIMES PER MONTH	ONCE PER WEEK	TWICE PER WEEK	3-4 TIMES PER WEEK	5-6 TIMES PER WEEK	EVERY DAY					
Real orange or grapefruit juice, Welch's grape juice, MinuteMaids juices, Juicy Juice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many glasses each time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hawaiian Punch, Sunny Delight, Hi-C, Tang, or Ocean Spray juices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many glasses each time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kool Aid, Capri Sun or Knudsen juices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many glasses each time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instant breakfast milkshakes like Carnation, diet shakes like Slimfast, or liquid supplements like Ensure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many glasses or cans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glasses of milk (any kind)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many glasses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When you drink glasses of milk what kind do you usually drink? MARK ONLY ONE:	<input type="checkbox"/> Whole milk <input type="checkbox"/> Non-fat milk <input type="checkbox"/> I don't drink milk or soy milk <input type="checkbox"/> Reduced fat 2% milk <input type="checkbox"/> Rice milk <input type="checkbox"/> Low-fat 1% milk <input type="checkbox"/> Soy milk												
Cream, Half-and-Half or non-dairy creamer in coffee or tea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many TSP or Tbsp says	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regular soft drinks, or bottled drinks like Snapple (Not diet drinks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many bottles or cans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many bottles or cans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wine or wine coolers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many glasses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liquor or mixed drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	How many drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

During the past year, have you taken any vitamins or minerals regularly, at least once a month?  
 No, not regularly  Yes, fairly regularly

**(IF YES) WHAT DID YOU TAKE FAIRLY REGULARLY?**

VITAMIN TYPE	HOW OFTEN				FOR HOW MANY YEARS?				
	LESS THAN 1 YR	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10-14 YEARS	15-19 YEARS	20+ YEARS	100%
Multiple Vitamins: Regular Once-A-Day, Centrum, or Thera type	0	0	0	0	0	0	0	0	0
Stress-tablets or B-Complex type	0	0	0	0	0	0	0	0	0
Antioxidant combination type	0	0	0	0	0	0	0	0	0
Single Vitamins (not part of multiple vitamins)	0	0	0	0	0	0	0	0	0
Vitamin A (not beta-carotene)	0	0	0	0	0	0	0	0	0
Beta-carotene	0	0	0	0	0	0	0	0	0
Vitamin C	0	0	0	0	0	0	0	0	0
Vitamin E	0	0	0	0	0	0	0	0	0
Folic acid, folate	0	0	0	0	0	0	0	0	0
Calcium or Tums, alone or combined with vit. D or magnesium	0	0	0	0	0	0	0	0	0
Zinc	0	0	0	0	0	0	0	0	0
Selenium	0	0	0	0	0	0	0	0	0
Vitamin D, alone or combined with calcium	0	0	0	0	0	0	0	0	0

**If you took vitamin C or vitamin E:**

How many milligrams of vitamin C did you usually take, on the days you took it?  
 100  250  500  750  1000  1500  2000  3000  don't know  
 How many lbs of vitamin E did you usually take, on the days you took it?  
 100  200  300  400  600  800  1000  2000+  don't know

How often do you use fat or oil in cooking?  
 Less than once per week  A few times per week  Once a day  Twice a day  3+ per day

What kinds of fat or oil do you usually use in cooking? **MARK ONE OR TWO**  
 Don't know, or Palm  Butter/margarine blend  Lard, fatback, bacon fat  
 Stick margarine  Low-fat margarine  Crisco  
 Soft tub margarine  Corn oil, vegetable oil  
 Butter  Olive oil or canola oil

Did you ever drink more beer, wine or liquor than you do now?  Yes  No

Do you smoke cigarettes now?  Yes  No

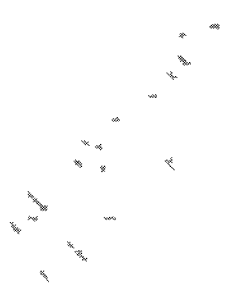
IF YES, on the average about how many cigarettes a day do you smoke now?  
 1-5  6-14  15-24  25-34  35 or more

**What is your ethnic group? (MARK ONE OR MORE)**

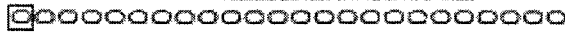
- Hispanic or Latino
- White, not Hispanic
- Black or African American
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Asian

**Thank you very much for filling out this questionnaire. Please take a minute to go back and see in copying you may have skipped.**

PLEASE DO NOT WRITE IN THIS AREA



PLEASE DO NOT WRITE IN THIS AREA



## APPENDIX D. GLOBAL PHYSICAL ACTIVITY QUESTIONNAIRE

The following questions will ask about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person.

Think first about the time you spend doing work/school activities. Think of these activities as the things that you have to do such as paid or unpaid work, study/training, or household chores. In answering the following questions, “vigorous-intensity activities” are activities that require hard physical effort and cause large increases in breathing or heart rate. “Moderate-intensity activities” are activities that require moderate physical effort and cause small increases in breathing or heart rate.

1. Does your work/school involve vigorous-intensity activities that cause large increases in breathing or heart rate for at least 10 minutes continuously?
  - Yes
  - No (go to question 4)
2. In a typical week, on how many days do you do vigorous-intensity activities as part of your work/school? \_\_\_\_\_
3. How much time do you spend doing vigorous-intensity activities at work/school on a typical day? \_\_\_\_\_ hours, \_\_\_\_\_ minutes
4. Does your work/school involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking or carrying light loads for at least 10 minutes continuously?
  - Yes
  - No (go to question 7)
5. In a typical week, on how many days do you do moderate-intensity activities as part of your work/school? \_\_\_\_\_
6. How much time do you spend doing moderate-intensity activities at work/school on a typical day? \_\_\_\_\_ hours, \_\_\_\_\_ minutes

The next questions exclude the physical activities at work/school that you have already mentioned. In the following questions, please describe the usual way you travel to and from places, such as work, school, or stores.

7. Do you walk or use a bicycle for at least 10 minutes continuously to get to and from places?
  - Yes
  - No (go to question 10)

8. In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places? \_\_\_\_\_
9. How much time do you spend walking or bicycling for travel on a typical day?  
\_\_\_\_\_ hours, \_\_\_\_\_ minutes

The next questions exclude the work, school, and transportation activities that you have already mentioned. In the following questions, please describe your sports, fitness, and recreational activities.

10. Do you do any vigorous-intensity sports, fitness or recreational activities that cause large increases in breathing or heart rate, such as running or football, for at least 10 minutes continuously?
- Yes
  - No (go to question 13)
11. In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational activities? \_\_\_\_\_
12. How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day? \_\_\_\_\_ hours, \_\_\_\_\_ minutes
13. Do you do any moderate-intensity sports, fitness or recreational activities that cause a small increase in breathing or heart rate, such as brisk walking, cycling, swimming, or volleyball, for at least 10 minutes continuously?
- Yes
  - No (go to question 16)
14. In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational activities? \_\_\_\_\_
15. How much time do you spend doing moderate-intensity sports, fitness or recreational activities on a typical day? \_\_\_\_\_ hours, \_\_\_\_\_ minutes

The following question is about sitting or reclining at work, at school, at home, getting to and from places, or with friends. This includes time spent sitting at a desk or computer, sitting with friends, travelling in a car or bus, playing video games, or watching television. This does NOT include time spent sleeping.

16. How much time do you usually spend sitting or reclining on a typical day?  
\_\_\_\_\_ hours, \_\_\_\_\_ minutes
17. How well does the statement, “I exercise for fun” describe you?\*
- \_\_\_\_\_ Does not describe me

\_\_\_ Sort of describes me

\_\_\_ Really describes me

\*Question about physical activity enjoyment, as described by Davison and Birch (2002).

**APPENDIX E. DEMOGRAPHICS QUESTIONNAIRE (YOUNG ADULT)**

1. What is your age? \_\_\_\_\_ gender? \_\_\_\_\_
2. Are you a part-time or full-time student? (select only one)
  - part-time
  - full-time
3. What is your student level? (select only one)
  - freshman
  - sophomore
  - junior
  - senior
4. Do you currently work to earn money? (select as many as apply)
  - No, I do not work to earn money
  - I work for my college/university in exchange for tuition, but I do not earn additional money
  - I work for my college/university as a student-worker to earn money
  - I work as a part-time employee to earn money
  - I work as a full-time employee to earn money
5. What is your current marital status? (select only one)
  - Single, never married
  - Single, divorced or widowed
  - Not married, but living with significant other
  - Married
6. Please describe your race/ethnicity. (select as many as apply)
  - Hispanic/Latino
  - White, not Hispanic
  - Native American
  - African American
  - Asian
  - Other (please provide): \_\_\_\_\_
7. What is your current living situation? (select only one)
  - I live with my parents
  - I live in a college/university dormitory or apartment
  - I rent a home off-campus
  - I own a home off-campus



8. What is your height? \_\_\_\_\_ feet, \_\_\_\_\_ inches
9. What is your weight? \_\_\_\_\_ pounds
10. Do you have an illness or disability that limits the foods you can eat?
- Yes
  - No
11. Do you have an illness or disability that limits your physical activity?
- Yes
  - No

**APPENDIX F. DEMOGRAPHICS QUESTIONNAIRE (PARENT)**

1. What is your age? \_\_\_\_\_ gender? \_\_\_\_\_
2. What is your occupation? \_\_\_\_\_
3. What is the highest level of education that you have completed? (select only one)
  - Less than high school diploma or equivalent
  - High school diploma or equivalent
  - Some college
  - 2-year degree
  - 4-year degree
  - Some graduate school
  - Graduate degree
4. What is your household income range? (select only one)
  - Less than \$40,000
  - \$40,000 - \$60,000
  - \$60,000 - \$80,000
  - \$80,000 - \$100,000
  - \$100,000 - \$120,000
  - \$120,000 - \$140,000
  - Greater than \$140,000
5. Please describe your race/ethnicity. (select as many as apply)
  - Hispanic/Latino
  - White, not Hispanic
  - Native American
  - African American
  - Asian
  - Other (please provide): \_\_\_\_\_
6. What is your height? \_\_\_\_\_ feet, \_\_\_\_\_ inches
7. What is your weight? \_\_\_\_\_ pounds
8. Do you have an illness or disability that limits the foods you can eat?
  - Yes
  - No

9. Do you have an illness or disability that limits your physical activity?
- Yes
  - No

## APPENDIX G. PARENTAL AUTHORITY QUESTIONNAIRE

Instructions: For each of the following statements, circle the number on the 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*) that best describes how that statement applies to you and your parents. Try to read and think about each statement as it applies to you and your parents during your years of growing up at home. There are no right or wrong answers, so don't spend a lot of time on any one item. We are looking for your overall impression regarding each statement. Be sure not to omit any items.

1. While I was growing up, my parents felt that in a well-run home, the children should have their way in the family as often as the parents do.\*
2. Even if the children didn't agree with them, my parents felt that it was for our own good if we were forced to conform to what they thought was right.\*\*
3. Whenever my parents told me to do something as I was growing up, they expected me to do it immediately without asking any questions.\*\*
4. As I was growing up, once family policy had been established, my parents discussed the reasoning behind the policy with the children in the family.\*\*\*
5. My parents have always encouraged verbal give-and-take whenever I have felt that family rules and restrictions were unreasonable.\*\*\*
6. My parents have always felt that what children need is to be free to make up their own minds and to do what they want to do, even if this does not agree with what their parents might want.\*
7. As I was growing up, my parents did not allow me to question any decision they had made.\*\*
8. As I was growing up, my parents directed the activities and decisions of the children in the family through reasoning and discipline.\*\*\*
9. My parents have always felt that more force should be used by parents in order to get their children to behave the way they are supposed to.\*\*
10. As I was growing up, my parents did *not* feel that I needed to obey rules and regulations of behavior simply because someone in authority had established them.\*

11. As I was growing up, I knew what my parents expected of me in my family, but I also felt free to discuss those expectations with my parents when I felt that they were unreasonable.\*\*\*
12. My parents felt that wise parents should teach their children early just who is boss in the family.\*\*
13. As I was growing up, my parents seldom gave me expectations and guidelines for my behavior.\*
14. Most of the time as I was growing up, my parents did what the children in the family wanted when making family decisions.\*
15. As the children in my family were growing up, my parents consistently gave us direction and guidance in rational and objective ways.\*\*\*
16. As I was growing up, my parents would get very upset if I tried to disagree with them.\*\*
17. My parents feel that most problems in society would be solved if parents would *not* restrict their children's activities, decisions, and desires as they are growing up.\*
18. As I was growing up, my parents let me know what behavior they expected of me, and if I didn't meet those expectations, they punished me.\*\*
19. As I was growing up, my parents allowed me to decide most things for myself without a lot of direction from them.\*
20. As I was growing up, my parents took the children's opinions into consideration when making family decisions, but they would not decide for something simply because the children wanted it.\*\*\*
21. My parents did not view themselves as responsible for directing and guiding my behavior as I was growing up.\*
22. My parents had clear standards of behavior for the children in our home as I was growing up, but they were willing to adjust those standards to the needs of each of the individual children in the family.\*\*\*

23. My parents gave me direction for my behavior and activities as I was growing up and they expected me to follow their directions, but they were always willing to listen to my concerns and to discuss that direction with me.\*\*\*
24. As I was growing up, my parents allowed me to form my own point of view on family matters and they generally allowed me to decide for myself what I was going to do.\*
25. My parents have always felt that most problems in society would be solved if we could get parents to strictly and forcibly deal with their children when they don't do what they are supposed to as they are growing up.\*\*
26. As I was growing up, my parents often told me exactly what they wanted me to do and how they expected me to do it.\*\*
27. As I was growing up, my parents gave me clear direction for my behaviors and activities, but they were also understanding when I disagreed with them.\*\*\*
28. As I was growing up, my parents did not direct the behaviors, activities, and desires of the children in the family.\*
29. As I was growing up, I knew what my parents expected of me in the family, and they insisted that I conform to those expectations simply out of respect for their authority.\*\*
30. As I was growing up, if my parents made a decision in the family that hurt me, they were willing to discuss that decision with me and to admit it if they had made a mistake.\*\*\*

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Note: The parental prototype represented by each item is denoted as follows:  
\*permissive, \*\*authoritarian, and \*\*\*authoritative.

## APPENDIX H. COMMUNICATION ENVIRONMENT INSTRUMENT

Please indicate how each of the following statements applies to you and your parents during your years of growing up at home. (For each question, a 5-point Likert scale was provided, with “Strongly Agree” equal to a score of 5 and “Strongly Disagree” equal to a score of 1.

1. ^In a family, it is better to avoid conflicts than to engage in them.
2. ^When I am at home, I am expected to obey my parents’ rules.
3. ^It is better to hide one’s true feelings in order to avoid hurting a family member.
4. ^My parents often say things like, “You should give in on arguments rather than risk making people mad.”
5. \*My parents often ask my opinion when the family is talking about something.
6. \*We tell each other how much we love or care about each other.
7. ^When anything really important is involved, my parents expect me to obey without question.
8. \*I usually tell my parents what I am thinking about things.
9. ^My parents feel that it is important to be the boss.
10. ^A woman should take her husband’s last name when she marries.
11. \*My parents encourage me to challenge their ideas and beliefs.
12. \*My parents encourage me to express my feelings.
13. ^My parents often say things like, “There are some things that just shouldn’t be talked about.”
14. \*In our family, we often talk about our feelings and emotions.
15. #My parents often say things like, “My ideas are right and you should not question them.”
16. #My parents sometimes become irritated with my views if they are different from theirs.

17. ^Some issues will disappear if two people can just avoid arguing about them.
18. +In our home, my parents usually have the last word.
19. \*In our family, we often talk about our plans and hopes for the future.
20. \*My family reassures and comforts me when I am feeling low.
21. #My parents often say things like “You’ll know better when you grow up.”
22. ^If my parents don’t approve of it they don’t want to know about it.
23. \*I can tell my parents almost anything.
24. \*My parents like to hear my opinions, even when they don’t agree with me.
25. #My parents often say things like, “A child should not argue with adults.”

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Note: The Communication Environment dimension represented by each question is denoted as follows: \*Expressive, ^Conflict avoidance, +Structural traditionalism, and #Expressly reinforced structural traditionalism.



## APPENDIX I. RESULTS USING TRANSFORMED DATA

Data for some of the variables of interest were not normal or not linear. Therefore, square root transformations were conducted for variables with high skewness or kurtosis values. Skewness and kurtosis values of the original data are provided in Table I1, and the improved skewness and kurtosis values of the transformed data are provided in Table I2.

### Preliminary Analyses

Considerations were made to analyze energy consumption, energy expenditure and physical activity enjoyment collectively as a dietary and physical activity score (DPA score) for young adult and parent participants. For both young adult and parent participants' reliability analyses, the transformed (square root of) energy consumption and energy expenditure measures were inserted into the analyses along with the original physical activity enjoyment measures. Cronbach's Alpha indicated that the three measures had very low internal consistency for both young adult (Cronbach's Alpha = .15) and parent (Cronbach's Alpha = .01) measures. For the young adult participants' measures, the internal consistency would have improved if the physical activity enjoyment measure would have been excluded, however the improved internal consistency would have continued to be low (Cronbach's Alpha = .18). Internal consistency for the parent participants' measures would have improved if the energy expenditure measure would have been removed, however the improved internal consistency would have continued to be low (Cronbach's Alpha = .03).

Bivariate Pearson correlations of the three measures were further examined and revealed that the young adult participants' transformed daily calories consumed and levels of physical activity enjoyment were significantly and positively correlated with their

Table II

*Skewness and Kurtosis Values of Original Study Data*

Variable	Skewness	SE of Skewness	Kurtosis	SE of Kurtosis
Young Adult BMI*	1.54	.20	3.15	.39
Young Adult Daily Calories*	1.79	.20	6.09	.40
Young Adult Weekly METs*	2.47	.20	9.63	.39
Young Adult Physical Activity Enjoyment	-0.16	.20	-0.82	.39
PAQ Authoritative Score	-1.21	.20	1.73	.40
PAQ Authoritarian Score	0.35	.20	-0.12	.39
PAQ Permissive Score	0.06	.20	-0.14	.39
CEI Expressiveness Score	-0.98	.20	0.95	.40
CEI Structural Traditionalism Score	0.24	0.20	-0.37	.40
CEI Conflict Avoidance Score	0.21	.20	-0.23	.40
Parent BMI*	1.93	.20	6.64	.39
Parent Daily Calories*	3.18	.21	15.91	.41
Parent Weekly METs*	2.31	.20	5.78	.39
Parent Physical Activity Enjoyment	0.36	.20	-0.70	.39

Note: \*Variable was transformed prior to conducting further analyses.

Table I2

*Skewness and Kurtosis Values of Transformed Study Data*

Variable	Skewness	SE of Skewness	Kurtosis	SE of Kurtosis
Young Adult BMI	1.26	.20	2.06	.39
Young Adult Daily Calories	0.81	.20	1.47	.40
Young Adult Weekly METs	0.80	.20	1.35	.39
Parent BMI	1.33	.20	3.73	.39
Parent Daily Calories	1.65	.21	5.68	.41
Parent Weekly METs	0.79	.20	0.49	.39

transformed weekly energy expenditure ( $p = .040$  for daily calories consumed and  $p = .002$  for physical activity enjoyment); however, the correlations were generally weak ( $r = .17$  for calories consumed and  $r = .25$  for physical activity enjoyment). Young adult participants' daily calories consumed and levels of physical activity enjoyment were not significantly correlated. For parent participants, levels of physical activity enjoyment and transformed weekly energy expenditure were moderately correlated,  $r = .31, p < .001$ .

To remove the potential influence of gender, the data were split between genders for both young adult and parent participants. For female young adult participants, the strength of the correlation of levels of physical activity enjoyment and transformed weekly energy expenditure increased,  $r = .38, p < .001$ ; however the other measures were not significantly correlated. None of the measures were significantly correlated for young adult males. For both female and male parent participants, levels of physical activity

enjoyment and transformed weekly energy expenditure were moderately correlated ( $r = .31, p < .001$  for females;  $r = .44, p = .050$  for males); no other measures were significantly correlated for the parent participants.

After splitting the data between young adult genders, internal consistency of young adults' average daily calories consumed, weekly energy expended, and levels of physical activity enjoyment remained low (Cronbach's Alpha = .04 for females; Cronbach's Alpha = .06 for males). Similarly, after splitting the data between parent genders, internal consistency of parents' three measures continued to be low (Cronbach's Alpha = -.03 for females; Cronbach's Alpha = .35 for males). Because of the lack of internal consistency among daily calories consumed, weekly energy expended, and levels of physical activity enjoyment, a composite DPA variable combining these measures was not computed. Instead, for the remaining analyses, energy consumption, energy expenditure and physical activity enjoyment measures were analyzed separately to compare young adults' and their parents' dietary and physical activity characteristics.

### **Hypothesis #1**

Upon examination of young adult and parent participants' weight statuses, parent participants, on average, had significantly higher transformed BMI scores ( $M = 5.22, SD = 0.55$ ) than young adult participants ( $M = 4.81, SD = 0.39$ ),  $t(150) = -8.8, p < .001$ . Young adult participants' transformed calorie consumption measure was significantly greater ( $M = 40.5, SD = 9.5$ ) than parent participants' transformed calorie consumption measure ( $M = 36.9, SD = 8.4$ ),  $t(137) = 4.0, p < .001$ . In addition, young adult participants' transformed energy expenditure measure was significantly greater ( $M = 66.1, SD = 29.3$ ) than parent participants' transformed energy expenditure measure ( $M = 41.6, SD = 30.4$ ),  $t(147) = 7.3,$

$p < .001$ . Young adult participants, on average, agreed with the statement, “I exercise for fun” ( $M = 2.1, SD = 0.7$ ) significantly more than parent participants ( $M = 1.7, SD = 0.6$ ),  $t(151) = 5.8, p < .001$ . The transformed amounts of daily calories consumed, the transformed amounts of weekly energy expended and the levels of physical activity enjoyment were all significantly different between young adult and parent participants.

### **Hypothesis #2**

Pearson correlation analyses revealed that young adult and parent participants’ transformed BMI scores and transformed daily calories consumed were moderately correlated (BMI scores:  $r = .29$ ; calories consumed:  $r = .32$ ), both at  $p < .001$ . Parent participants’ transformed weekly energy expenditure and levels of physical activity enjoyment were inversely correlated with young adult participants’ transformed BMI scores (energy expenditure:  $r = -.19, p = .018$ ; physical activity enjoyment:  $r = -.25, p = .002$ ), which indicated that young adults’ BMIs decreased as their parents’ weekly energy expenditure and levels of physical activity enjoyment increased.

### **Research Question #1**

**BMI scores and parental authority scales.** The linear combination of parents’ transformed BMI scores and the parental authority scales significantly predicted young adults’ transformed BMI scores,  $R^2 = .10$ , adjusted  $R^2 = .07$ ,  $F(4, 143) = 3.74, p = .006$  (see Table I3). Parents’ transformed BMIs was a significant predictor while the parental authority scales were not significant. When inserted into the regression analysis, interaction terms for parents’ transformed BMIs and the parental authority scales significantly contributed to the overall model,  $R^2 = .15$ , adjusted  $R^2 = .11$ ,  $F(7, 140) = 3.57, p = .001$  (see Table I4). Both the Authoritarian and Permissive parenting styles emerged as

significant moderators of the relationship of parents' and young adults' transformed BMI scores.

Table I3

*Main Effects of Parents' Transformed BMI and PAQ Measures on Young Adults' Transformed BMI*

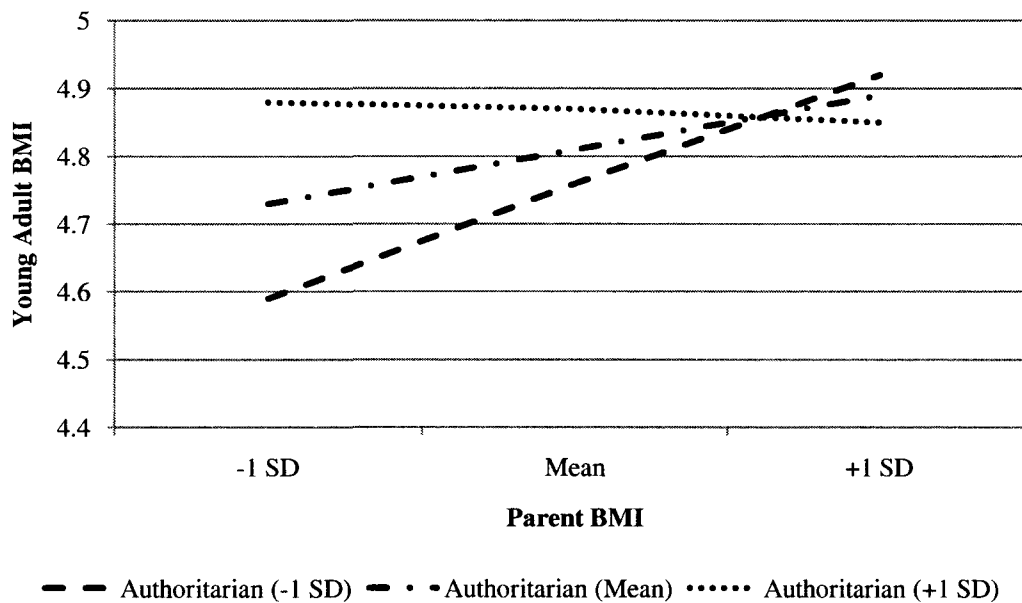
Variable	$\beta$	SE	<i>t</i>	<i>p</i>
Parents' BMI (transformed)	0.20	0.6	3.5	.001
Authoritative parenting score	0.05	0.6	0.8	.439
Authoritarian parenting score	0.20	0.6	1.6	.112
Permissive parenting score	0.03	0.6	0.5	.605

Table I4

*Interaction Effects of Parents' Transformed BMI and PAQ Measures on Young Adults' Transformed BMI*

Variable	$\beta$	SE	<i>t</i>	<i>p</i>
Parents' BMI (transformed)	0.14	0.1	2.3	.025
Authoritative parenting score	0.06	0.1	1.0	.331
Authoritarian parenting score	0.09	0.1	1.5	.127
Permissive parenting score	0.03	0.1	0.5	.625
Parents' BMI * Authoritative	-0.13	0.1	-1.2	.245
Parents' BMI * Authoritarian	-0.27	0.1	-2.7	.009
Parents' BMI * Permissive	-0.32	0.1	-2.5	.015

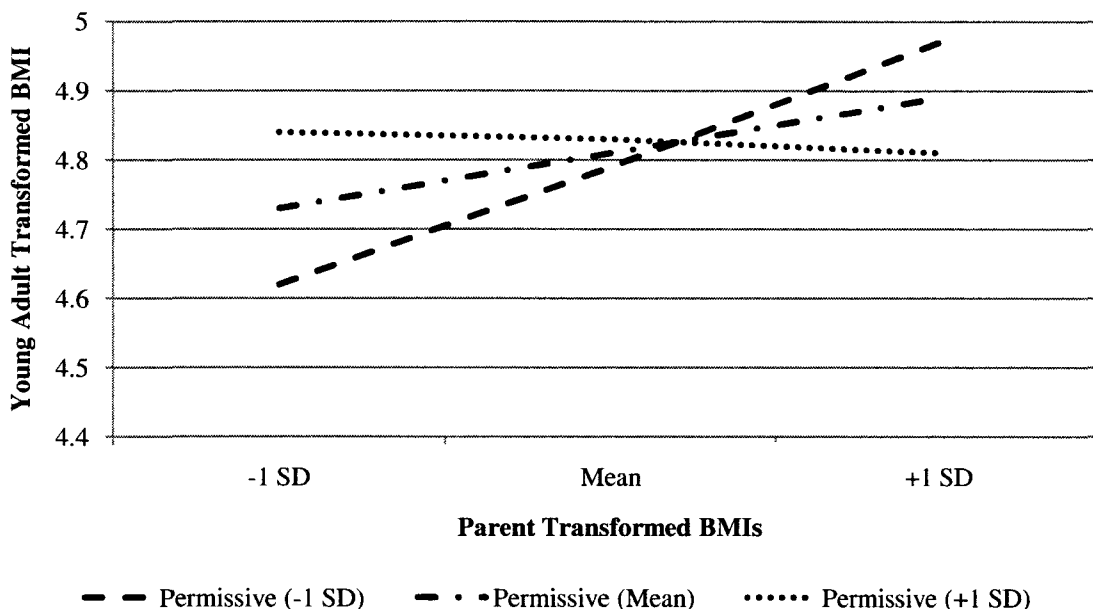
The way in which authoritarian parenting moderated the relationship between parents' transformed BMIs and their young adult children's transformed BMIs is represented in Figure 11. For young adults of parents who exhibited low or moderate levels of authoritarian parenting, their parents' BMIs positively predicted their own BMIs. However, for young adults whose parents exhibited high levels of authoritarian parenting, their parents' BMIs were inversely related to their own BMIs.



*Figure 11.* Predicted values of young adults' transformed BMIs at mean and +/- 1 SD of parents' transformed BMIs and Authoritarian parenting scores. Other parenting styles in the model were evaluated at their means.

The way in which permissive parenting moderated the relationship between parents' transformed BMIs and their young adult children's transformed BMIs is represented in Figure 12. Similar to authoritarian parenting, for young adults of parents who exhibited low or moderate levels of permissive parenting, their parents' BMIs positively predicted their own BMIs. However, for young adults whose parents exhibited

high levels of permissive parenting, their parents' BMIs were inversely related to their own BMIs.



*Figure 12.* Predicted values of young adults' transformed BMIs at mean and +/- 1 SD of parents' transformed BMIs and Permissive parenting scores. Other parenting styles in the model were evaluated at their means.

**Daily energy consumption and parental authority scales.** The linear combination of parents' transformed daily energy consumption and the parental authority scales significantly predicted young adults' transformed daily energy consumption,  $R^2 = .14$ , adjusted  $R^2 = .12$ ,  $F(4, 131) = 5.38$ ,  $p < .001$  (see Table I5). Parents' transformed daily energy consumption was a significant predictor, while the parental authority scales were not significant. When inserted into the regression analysis, interaction terms for the parents' transformed daily energy consumption measure and the parental authority scales significantly contributed to the overall model,  $R^2 = .27$ , adjusted  $R^2 = .23$ ,  $F(7, 128) = 6.88$ ,  $p < .001$  (see Table I6). The Authoritarian parenting style emerged as a significant



moderator of the relationship of parents' and young adults' transformed daily energy consumption. Interaction variables for the other parental authority scales were not significant.

The way in which authoritarian parenting moderated the relationship between parents' transformed daily calorie consumption and their young adult children's transformed daily calorie consumption is represented in Figure I3. For young adults of parents who exhibited low or moderate levels of authoritarian parenting, their parents' transformed average daily calorie consumption positively predicted their own transformed average daily calorie consumption. However, for young adults whose parents exhibited high levels of authoritarian parenting, their parents' transformed average daily calorie consumption was inversely related to their own transformed average daily calorie consumption.

Table I5

*Main Effects of Parents' Transformed Daily Calories Consumed and PAQ Measures on Young Adults' Transformed Daily Calories Consumed*

Variable	$\beta$	SE	T	p
Parents' calories consumed per day (transformed)	0.39	0.10	4.1	< .001
Authoritative parenting score	2.37	1.57	1.5	.134
Authoritarian parenting score	1.18	1.46	0.8	.421
Permissive parenting score	2.70	1.61	1.7	.095

Table I6

*Interaction Effect of Parents' Transformed Daily Calories Consumed and PAQ Measures on Young Adults' Transformed Daily Calories Consumed*

Variable	$\beta$	SE	<i>t</i>	<i>p</i>
Parents' calories consumed per day (transformed)	0.15	0.11	1.4	.153
Authoritative parenting score	2.34	1.47	1.6	.113
Authoritarian parenting score	2.17	1.38	1.6	.119
Permissive parenting score	2.39	1.50	1.6	.114
Parents' calories * Authoritative	-0.31	0.19	-1.6	.109
Parents' calories * Authoritarian	-0.66	0.16	-4.2	< .001
Parents' calories * Permissive	-0.18	0.19	-0.9	.362

**Weekly energy expenditure and physical activity enjoyment.** The relationships of parents' and young adults' weekly energy expenditure and levels of physical activity enjoyment were examined along with the moderating relationships of parental authority scales. Parents' weekly energy expenditure was not a significant predictor of young adults' weekly energy expenditure,  $p = .455$ , and parental authority scales did not significantly contribute to the relationship ( $p = .982$  for Authoritative;  $p = .539$  for Authoritarian;  $p = .947$  for Permissive). Similarly, parents' levels of physical activity enjoyment did not significantly predict young adults' levels of physical activity enjoyment,  $p = .374$ , and parental authority scales did not significantly contribute to the relationship ( $p = .202$  for Authoritative;  $p = .747$  for Authoritarian;  $p = .683$  for Permissive).

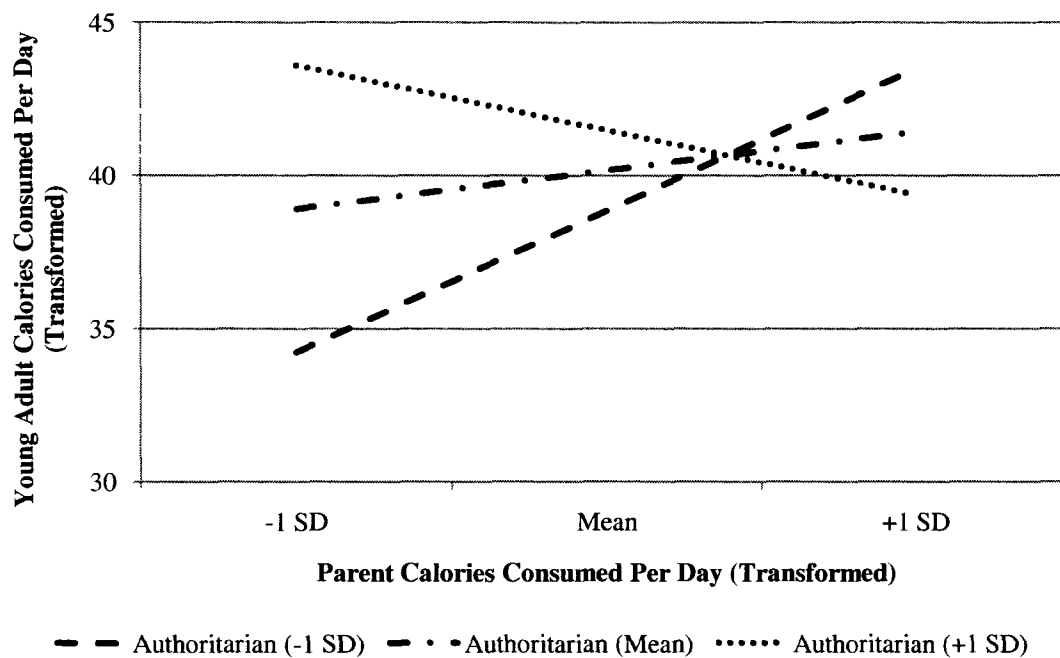


Figure 13. Predicted values of young adults' transformed daily calories consumed at mean and +/- 1 SD of parents' transformed daily calories consumed and Authoritarian parenting scores. Other parenting styles in the model were evaluated at their means.

**Family communication environment scales.** The relationships of parents' and young adults' transformed BMI scores, transformed daily energy consumption, transformed weekly energy expenditure and levels of physical activity enjoyment were examined along with the moderating relationships of family communication environment scales. In each model, there were no significant main effects or interaction effects involving the family communication environment variables ( $p$ -values ranged from .117 to .984 for main variables;  $p$ -values ranged from .231 to .843 for interaction variables).

## Research Question #2

Young adults' and parents' transformed BMI scores, transformed daily energy consumption, transformed weekly energy expenditure, physical activity enjoyment, parental authority scales and family communication environment scales were considered

along with young adults' genders and ages and parents' genders, ages, education levels, and household income levels. The gender of young adults is significantly correlated with their transformed BMI scores,  $r = .34, p < .001$ , and their transformed weekly energy expenditure,  $r = .24, p = .004$ , indicating young adult males have higher BMI's, consume more calories per day and expend more energy per week than young adult females. In addition, independent samples t-tests indicate significant differences between young adult males' and females' transformed BMI scores,  $t(151) = -2.64, p = .009$ , transformed daily energy consumption,  $t(142) = -4.31, p < .001$ , and transformed weekly energy expenditure,  $t(149) = -2.95, p = .004$ .

When controlling for gender of young adults, correlations among young adult females' and parents' transformed variables of interest are similar, although the significant correlations are strengthened. Young adult females' and parents' transformed BMI scores have a moderate-to-strong correlation,  $r = .46, p < .001$ . Young adult females' and parents' transformed daily calories consumed are moderately correlated,  $r = .41, p < .001$ . Both parents' transformed weekly energy expended and parents' levels of physical activity enjoyment are inversely related to young adult females' transformed BMI scores (energy expended:  $r = -.23, p = .029$ ; physical activity enjoyment:  $r = -.35, p = .001$ ). Among young adult male and parent participants, significant correlations do not exist among the variables of interest.

Further regression analyses were conducted to consider the influence of gender of young adult participants. First, a separate regression analysis was conducted and included young adults' transformed daily energy consumption as the dependent variable and young adult gender (male), parent transformed daily energy consumption, and the interaction

between them (i.e. their product). The regression model for the main effect was significant,  $R^2 = .24$ , adjusted  $R^2 = .23$ ,  $F(2, 134) = 20.76$ ,  $p < .001$ ; however the interaction term did not contribute to the overall model and was not significant,  $p = .68$ .

Also, a separate regression analysis was conducted and included young adults' transformed BMI as the dependent variable and young adult gender, parent transformed BMI, and the interaction between them. The regression model for the main effect was significant,  $R^2 = .14$ , adjusted  $R^2 = .13$ ,  $F(2, 147) = 11.64$ ,  $p < .001$ ; however the interaction term was not significant,  $p = .107$ .

**BMI scores and parental authority, controlling for gender.** The young adult gender variable was included in the regression analysis of the predictive relationship of parents' transformed BMI score and parental authority scales on young adults' transformed BMI scores. The linear combination of young adults' gender variable along with parents' transformed BMI score and the parental authority scales significantly predicted young adults' transformed BMI,  $R^2 = .14$ , adjusted  $R^2 = .11$ ,  $F(5, 141) = 4.45$ ,  $p = .001$  (see Table I7). Terms for the interactions between parents' transformed BMI score and the parental authority scales significantly contributed to the model,  $R^2 = .19$ , adjusted  $R^2 = .14$ ,  $F(8, 138) = 3.94$ ,  $p < .001$  (see Table I8). Significant predictors of young adults' transformed BMIs were young adult gender (male), parents' BMIs, the interaction of parents' BMI score and the Authoritarian measure and the interaction of parents' BMI score and the Permissive measure. When controlling for gender, both authoritarian and permissive parenting styles moderated the predictive relationship of parents' transformed BMI and young adults' transformed BMI.

Table I7

*Main Effects of Young Adults' Gender, Parents' Transformed BMI, and PAQ Measures on Young Adults' Transformed BMI*

Variable	$\beta$	SE	t	p
Young adult gender (male)	0.17	0.06	2.6	.011
Parents' BMI (transformed)	0.21	0.06	3.8	< .001
Authoritative parenting score	0.05	0.06	0.8	.403
Authoritarian parenting score	0.06	0.06	1.1	.281
Permissive parenting score	0.01	0.06	0.2	.868

Table I8

*Interaction Effects of Young Adults' Gender, Parents' Transformed BMI and PAQ Measures on Young Adults' Transformed BMI*

Variable	$\beta$	SE	t	p
Young adult gender (male)	0.15	0.06	2.4	.019
Parents' BMI (transformed)	0.15	0.06	2.6	.011
Authoritative parenting score	0.06	0.06	1.0	.317
Authoritarian parenting score	0.06	0.06	1.1	.292
Permissive parenting score	0.01	0.06	0.2	.852
Parents' BMI * Authoritative	-0.13	0.11	-1.2	.233
Parents' BMI * Authoritarian	-0.23	0.10	-2.3	.022
Parents' BMI * Permissive	-0.31	0.13	-2.5	.016

The moderating effects of the parenting styles on the relationship between parents' BMIs and young adults' transformed BMIs were not affected by gender. Rather, gender was simply a main effect, indicating that males have overall higher BMIs than females. This interaction is represented previously in Figures I1 and I2.

**Daily energy consumption and parental authority scales, controlling for gender.** Young adult gender was included in the regression analysis of the predictive relationships of parents' transformed average daily energy consumption and parental authority scales on young adults' transformed average daily energy consumption. The linear combination of the young adults' gender variable, the parents' transformed daily energy consumption measure and the parental authority scales significantly predicted young adults' transformed daily energy consumption,  $R^2 = .26$ , adjusted  $R^2 = .23$ ,  $F(5, 129) = 9.02$ ,  $p < .001$  (see Table I9). Terms for the interaction between parents' transformed daily energy consumption measure and the parental authority scales significantly contributed to the model,  $R^2 = .37$ , adjusted  $R^2 = .33$ ,  $F(8, 126) = 9.26$ ,  $p < .001$  (see Table I10). Significant predictors of young adults' transformed average daily energy consumption included young adult gender (male), parents' transformed average daily energy consumption, Authoritative parenting score and the interaction of parents' transformed energy consumption and the Authoritarian parenting score.

When controlling for gender, the authoritative parenting style was directly positively related to the transformed amounts of calories consumed per day by young adults, no matter the levels of transformed calories consumed per day by their parents, at  $p = .094$ . The moderating relationship of the authoritarian parenting style persisted when controlling for young adult gender. High levels of the authoritarian parenting style were

associated with an inverse relationship of young adults' and their parents' transformed average calories consumed per day.

**Other measures, controlling for gender.** Predictors of transformed weekly energy expenditure and physical activity enjoyment remained non-significant when controlling for gender. Similarly, the family communication environment scales remained non-significant when the gender variable was included in the regression analyses.

Table I9

*Main Effects of Young Adults' Gender, Parents' Transformed Daily Calories Consumed and PAQ Measures on Young Adults' Transformed Daily Calories Consumed*

Variable	$\beta$	SE	t	p
Young adult gender (male)	6.91	1.53	4.5	< .001
Parents' calories consumed per day	0.44	0.09	4.9	< .001
Authoritative parenting score	2.49	1.47	1.7	.094
Authoritarian parenting score	0.22	1.39	0.2	.877
Permissive parenting score	1.46	1.53	1.0	.340



Table I10

*Interaction Effects of Young Adults' Gender, Parents' Transformed Daily Calories Consumed and PAQ Measures on Young Adults' Transformed Daily Calories Consumed*

Variable	$\beta$	SE	t	p
Young adult gender (male)	6.29	1.43	4.4	< .001
Parents' calories consumed per day	0.22	0.10	2.2	.033
Authoritative parenting score	2.43	1.38	1.8	.079
Authoritarian parenting score	1.20	1.32	0.9	.364
Permissive parenting score	1.30	1.43	0.9	.366
Parents' calories * Authoritative	-0.31	0.18	-1.7	.085
Parents' calories * Authoritarian	-0.60	0.15	-4.1	< .001
Parents' calories * Permissive	-0.20	0.18	-1.1	.267